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Nr. 4. A. C. Johansen: THE ATLANTO-SCANDIAN SPRING HERRING SPAWNING AT THE FAROES.

KØBENHAVN
C. A. REITZEL, BOGHANDEL
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1921

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MEDDELELSER FRA KOMMISSIONEN FOR HAVUNDERSØGELSER
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ON THE SUMMER-SPAWNING HERRING (CLUPEA HARENGUS L.) OF ICELAND

BY

DR. A. C. JOHANSEN

KØBENHAVN
C. A. REITZEL, BOGHANDEL
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I. Introduction.

The well known Icelandic naturalist Bjarni Sæmundsson was the first to give us the information that a summer-spawning herring occurs at Iceland. In his »Oversigt over Islands Fiske«[1]) he writes as follows (p. 103): »It appears that there are two quite distinct spawning periods, one in spring (March—April) at the south and south-west coast, another in summer (July—August) at the south-west and the west coast. Whilst I only know very little with regard to the spawning places of the spring-spawning herring (having obtained only a few mature herrings from the south coast in April) I have succeeded in establishing the fact that the summer-spawning herring begins its spawning about the middle of July. This takes place for the greater part on the stretch Eldey Bank—Breidafiord at a depth of 60—100 fms up to about 20 miles off shore. In this area large numbers of herrings were caught in drift-net during the last few years (May—July). — Whether the herrings here belong to two different races, I cannot say yet with any certainty«.

The result of Sæmundsson's investigation: that the spawning period of the Icelandic herring is not continuous, but extends over two different periods of the year, was confirmed later by P. Jespersen, who on the basis of Johs. Schmidt's fishing experiments in the years 1903, 1904, 1905 and 1908 has published a survey on the occurrence of the postlarval stages of the herring off the coasts of Iceland in some of the months of the years mentioned[2]).

The difference in the spawning time makes us naturally think, that the question here is about two different herring races. This question, upon which Sæmundsson has made a preliminary examination, I have wanted to make the object of a closer investigation, and for this purpose I have received kind assistance from Dr. Johs. Schmidt as well as from Dr. Sæmundsson. The former has kindly placed spring-spawning herrings at my disposal, while the latter has provided me with samples of maturing and mature summer-spawning herrings.

In the investigation of the race-peculiarities of the summer-spawning herring I have used the same method which I employed previously in the consideration of the spring-spawning herring in the North-West European waters[3]). The characters, which have been chosen here as a basis for the race study, are such that when once developed and fixed remain constant during the whole life of the specimens.

Besides the total length, sex and maturity the following characters were taken up for biometrical treatment:

[1]) Skrifter udgivne af Kommissionen for Havundersøgelser Nr. 5. København. 1908.

[2]) P. Jespersen: On the occurrence of the postlarval stages of the Herring and the »Lodde« (Clupea harengus L., and Mallotus villosus O. F. M.) at Iceland and the Faroes. Medd. Komm. f. Havundersøgelser Serie: Fiskeri. Bind VI: No. 1. København 1920.

[3]) A. C. Johansen: On the large spring-spawning Sea Herring (Clupea harengus L.) in the North-West European Waters. Meddelelser Komm. f. Havundersøgelser. Ser. Fiskeri, Bd. V. No. 8 København 1919.

1. Number of vertebrae:
   a. precaudal vertebrae
   b. caudal vertebrae
   c. total number of vertebrae (vert. S.).
2. Number of keeled scales between the ventral fins and anus (K_2).
3. Number of fin rays in both ventral fins.
4. (in some cases) Number of rays in right pectoral fin.
5. Number of fin rays in dorsal fin:
   a. unbranched rays
   b. branched rays
   c. total number of rays.
6. Number of fin rays in anal fin:
   a. unbranched rays
   b. branched rays
   c. total number of rays.

The three first named characters have been treated in my paper: »On the large spring-spawning

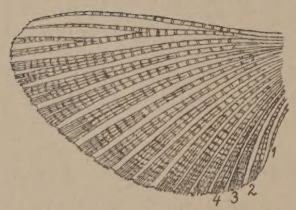

Fig. 1. Pectoral fin of Herring. 17 rays.

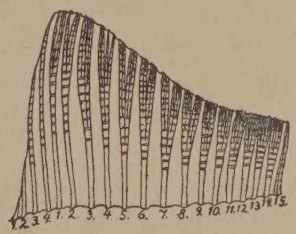

Fig. 2. Dorsal fin of Herring with 4 unbranched and 15 branched rays.
The figures are drawn by Miss B. Rohweder.

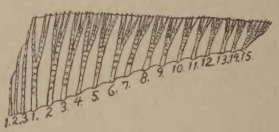

Fig. 3. Anal fin of Herring with 3 unbranched and 15 branched rays.

Sea Herring in the North-West European Waters«. About the three last characters some remarks may be made here:

Pectoral fin (Fig. 1). The inmost and the outmost ray are unbranched, the rest branched. The inner rays are very small and great care is demanded here in counting.

Dorsal fin (Fig. 2). The foremost ray may be rudimentary. This offers a difficulty in the counting. If we want to compare the ray-countings of different naturalists, it will thus be safest to regard only the branched rays. The counting of these do not present any difficulties.

Anal fin (Fig. 3). In the anal fin the foremost ray is well developed, though generally shorter than on Fig. 3. As a rule the counting here does not entail any special difficulty either for the unbranched or for the branched rays.

For all the fins it holds good that the rays are developed in the larval stage long before the formation of scales begins. It has not been further investigated in which stage of the development the number of rays is finally fixed.

Between several of the characters mentioned here a correlation exists. Thus there is for example a positive correlation between the numerical values for the following characters:

Total number of vertebrae and number of precaudal vertebrae
— — - — - — - caudal —
— — - — - — - keeled scales (K_2)
— — - — - — - dorsal fin rays.
— — - — - — - anal fin rays.
Total number of dorsal fin rays and number of branched dorsal rays
— — - — - - - — - unbranched — —
Total number of anal fin rays and number of branched anal rays
— — - - - - - — - unbranched - -

Between the number of precaudal vertebrae and the number of caudal vertebrae there is a very marked negative correlation, as shown in the example below (referring to a sample of summer spawning herrings from Eldey Bank. S. W. Iceland, May 1919):

Precaudal vert.	Caudal vert. 29	30	31	32	33	34	35	Total.
22	—	—	—	—	1	—	1	2
23	—	—	—	2	7	20	2	31
24	—	—	1	18	65	19	—	103
25	—	—	7	73	19	1	—	100
26	—	4	27	13	—	1	—	45
27	1	6	6	—	—	—	—	13
28	1	2	—	—	—	—	—	3
Total	2	12	41	106	92	41	3	297

From this we get the correlation coefficient r[1]) = — 0.8151 with standard deviation:

$$\sigma_r = 0.0195.$$

A negative correlation also occurs between the unbranched and branched dorsal fin rays and between the unbranched and branched anal fin rays, but the correlation coefficient is here of a numerically lower value than in the example given above.

The correlation between the different characters will be subjected to a further treatment in a following treatise. The material has been treated in such a way in the present paper that the correlation does not interfere with the results obtained.

If it appears that a correlation exists between the length of the specimens and one or several of the above mentioned individually constant characters, we may conclude, either — that the employed material originates from more than one race, or — that different age groups of the same race are not perfectly uniform with regard to the characters in question.

If such a correlation is observed, it invites us to a further analysis of the material with respect to the age, maturity, and other characters of the specimen.

[1]) For the calculation of the correlation coefficient PEARSON's formula was used:

$$r = \frac{\Sigma p \alpha_x \alpha_y}{\sqrt{\Sigma p' \alpha_x^2 \cdot \Sigma p'' \alpha_y^2}} = \frac{\Sigma p a_x \cdot a_y - n b_x \cdot b_y}{(n-1)\,\sigma_x \sigma_y}$$

α_x and α_y indicate the deviation from the mean values for the two series; p is the number of variates in each of the classes; a_x and a_y are the deviations from the chosen starting points for the calculation of the mean value, and b_x and b_y indicate for each of the two series the distance between the true mean and the starting point for the mean value calculation.

n = total number of variates

σ is calculated after the formula

$$\sigma = \pm \sqrt{\frac{\Sigma p \alpha^2}{(n-1)}} = \pm \sqrt{\frac{1}{n(n-1)}} \cdot \sqrt{n \Sigma p a^2 - (\Sigma p a)^2}.$$

By the counting of the various characters examined I have been assisted by cand. phil. S. Weis Fogh, mag. scient. P. L. Kramp and stud. mag. Erik M. Poulsen. Most of the calculations have been made by Fru E. Neergaard-Møller. I am indebted to Dr. Kirstine Smith for critical remarks to the paper.

II. The distinguishing marks of the summer-spawning Herring.

The material of summer-spawning Icelandic herrings, with which I have dealt, originate from two different localities, viz. Eldey Bank West of Cap Reykjanæs (on the S. W. coast) and Drangar in the neigbourhood of the Westmanna Isles (Fig. 4). The investigated sample of herring from Eldey Bank was obtained at the end of May 1919. The sample comprised 297 herrings, of which 169 were males and 128 females. The lengths of the specimens were as follows:

Length cm	♂	♀	Total	Length cm	♂	♀	Total
28	—	1	1	34	20	25	45
29	4	1	5	35	17	11	28
30	5	4	9	36	10	2	12
31	14	8	22	37	2	2	4
32	49	24	73	38		1	1
33	48	49	97	Total:	169	128	297

The males as well as the females were approaching maturity. The stage of maturity was usually IV for the females, IV and V for the males. (See General Survey A. p. 27). Transparent eggs did not occur in any of the females. The spawning had not begun, probably it would have occurred 1—2 months after the capture.

The distribution of the specimens according to length and number of winter rings in the scales was as follows:

Herrings, Eldey Bank, May 1919.

Length cm. . . .		28	29	30	31	32	33	34	35	36	37	38	Total	Average length cm.	+ 0.5
Age group	No. of winter rings														
1915	3	—	1	—	—	—	—	—	—	—	—	—	1	29.0	29.5
1914	4	—	3	7	4	2	2	1	—	—	—	—	19	31.32	31.82
1913	5	—	—	—	2	4	4	1	—	—	—	—	11	32.36	32.86
1912	6	—	—	2	6	28	28	4	1	—	—	—	69	32.42	32.92
1911	7	1	1	—	6	29	48	18	7	2	—	—	112	32.89	33.39
1910	8	—	—	—	1	2	7	7	4	3	—	—	24	33.84	34.34
1909	9	—	—	—	—	—	2	7	3	—	—	—	12	34.10	34.60
1908	10	—	—	—	—	1	—	2	8	3	1	—	15	35.00	35.50
1907	11	—	—	—	—	—	—	1	2	2	2	—	7	35.71	36.21
1906	12	—	—	—	—	—	—	—	1	1	—	—	2	35.50	36.0
1905	13	—	—	—	—	—	—	—	—	—	1	1	2	37.50	38.0
1904	14	—	—	—	—	—	—	—	—	1	—	—	1	36.00	36.5
	6—7	—	—	—	—	1	—	—	—	—	—	—	1	32.00	32.5
	7—8	—	—	—	1	—	—	—	—	—	—	—	1	31.00	31.5
	9—10	—	—	—	—	—	—	—	1	—	—	—	1	35.00	35.5
	10—12	—	—	—	—	1	—	—	—	—	—	—	1	32.00	32.5
	?	—	—	—	2	5	6	4	1	—	—	—	18	32.83	33.33
	Total:	1	5	9	22	73	97	45	28	12	4	1	297		

If we take it for granted that the first distinct winter ring in the scale is formed when the specimens are ca. $1^1/_2$ years old, it will be seen that the specimens at the age of 7 years are of an average length of ca. 33 cm and those of 10 years of an average length of ca. 36 cm. Starting from the same hypothesis, the series 1911 has yielded the largest contingent and the series 1913 an extraordinarily small contingent to the sample.

The numerical values found for the various characters examined were as follows:

Vertebrae.

Vert S.		Prec. Vert.		Caudal Vert.	
No.	Freq.	No.	Freq.	No.	Freq.
55	4	22	2	29	2
56	37	23	31	30	12
57	193	24	103	31	41
58	61	25	100	32	106
59	1	26	45	33	92
60	1	27	13	34	41
		28	3	35	3
n	297		297		297
m	57.071		24.694		32.377
σ	0.65		1.074		1.084
σ_m	0.038		0.062		0.063
σ_σ	0.027		0.044		0.044

Dorsal fin rays.

Total.		Branched		Unbranched.	
No.	Freq.	No.	Freq.	No.	Freq.
18	16	14	30	3	8
19	162	15	170	4	240
20	110	16	93	5	49
21	9	17	4		
n	297		297		297
m	19.377		15.239		4.138
σ	0.636		0.642		0.416
σ_m	0.037		0.037		0.024
σ_σ	0.026		0.026		0.017

Anal fin rays.

Total.		Branched.		Unbranched.	
No.	Freq.	No.	Freq.	No.	Freq.
16	7	13	7	2	9
17	55	14	61	3	252
18	133	15	143	4	36
19	90	16	78		
20	11	17	8		
21	1				
n	297		297		297
m	18.155		15.064		3.091
σ	0.860		0.817		0.379
σ_m	0.050		0.047		0.022
σ_σ	0.035		0.034		0.016

Keeled Scales (K_2)		Ventr. rays.		Rays in right pect.	
No.	Freq.	No.	Freq.	No.	Freq.
12	28	16	14	16	1
13	111	17	21	17	4
14	132	18	239	18	9
15	22	19	17	19	1
16	2	20	5		
n	295		296		15
m	13.522		17.926		17.667
σ	0.79		0.62		0.724
σ_m	0.057		0.036		0.187
σ_σ	0.040		0.025		0.132

The investigated sample of herrings from Drangar (at the Westmanna Isles) was captured on August 14th 1919. The sample comprised 136 males and 44 females. The lengths of the specimens were as follows:

Length cm	♂	♀	Total	Length cm	♂	♀	Total
25	2	—	2	32	23	3	26
26	11	2	13	33	19	5	24
27	19	4	23	34	6	7	13
28	22	13	35	35	3	—	3
29	14	4	18	36	2	2	4
30	8	—	8	37		2	2
31	7	2	9	Total:	136	44	180

The specimens were mature and the spawning had evidently begun in several cases. The maturity was most frequently VI, in some cases V, more rarely VI—VII or VII (see General Survey B. p. 32).

According to informations from Sæmundsson, founded on statements from fishermen from the Westmanna Isles, the herring fishery ended in this place before the end of August, having lasted from early July.

The distribution of the specimens according to length and number of winter rings was as follows:

Herrings. Drangar 14. Aug. 1919.

Length cm. . . .		25	26	27	28	29	30	31	32	33	34	35	36	37	Total	Average length cm.	+0.5
Age group	No. of Winter rings																
1916	2	—	1	—	—	—	—	—	—	—	—	—	—	—	1	26.0	26.5
1915	3	2	11	18	19	5	3	1	1	—	—	—	—	—	60	27.53	28.03
1914	4	—	—	3	13	9	3	2	2	—	1	—	—	—	33	28.97	29.47
1913	5	—	—	—	1	—	1	1	5	1	1	—	—	—	10	31.60	32.10
1912	6	—	—	—	1	1	1	5	8	15	4	1	—	—	36	32.34	32.84
1911	7	—	—	—	—	—	—	—	4	6	3	—	1	—	14	33.14	33.64
1910	8	—	—	—	—	—	—	—	—	—	1	—	—	—	1	34.0	34.5
1909	9	—	—	—	—	—	—	—	—	—	—	—	1	1	2	36.5	37.0
1908	10	—	—	—	—	—	—	—	—	—	—	1	2	—	3	35.67	36.17
	3—4	—	—	1	—	1	—	—	—	—	—	—	—	—	2	28.0	28.5
	4—5	—	—	—	—	2	—	—	1	—	—	—	—	—	3	30.0	30.5
	5—6	—	—	—	—	—	—	—	1	—	—	—	—	—	1	32.0	32.5
	6—7	—	—	1	—	—	—	—	3	—	—	—	—	—	4	30.75	31.25
	7—8	—	—	—	—	—	—	—	—	1	—	—	—	—	1	33.0	33.5
	8—9	—	—	—	—	—	—	—	1	—	1	—	—	—	2	33.0	33.5
	9—10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	8—10	—	—	—	—	—	—	—	—	—	1	—	—	—	1	34.0	34.5
	?	—	1	—	1	—	—	—	—	1	1	1	—	1	6	32.17	32.67
	Total:	2	13	23	35	18	8	9	26	24	13	3	4	2	180		

It will be seen that the average length of the specimens aged 4 years was ca. 28 cm. The few specimens aged 9—11 years were of an average length of ca. 36 cm. The series 1915 has yielded the largest contingent, and the series 1913 — as at Eldey Bank — an extraordinarily small contingent to the sample.

The statistical analyses of the various characters examined gave the following results:

Vertebrae.

Vert. S.		Prec. Vert.		Caudal Vert.	
No.	Freq.	No.	Freq.	No.	Freq.
54	1	22	1	28	1
55	—	23	13	29	1
56	28	24	71	30	4
57	120	25	65	31	28
58	29	26	24	32	61
59	2	27	4	33	65
		28	1	34	19
		29	1	35	1
n	180		180		180
m	57.011		24.661		32.350
σ	0.64		0.99		1.05
σ_m	0.048		0.074		0.078
σ_σ	0.034		0.052		0.055

Dorsal fin rays.

Total		Branched		Unbranched	
No.	Freq.	No.	Freq.	No.	Freq.
18	7	14	11	3	1
19	107	15	121	4	152
20	60	16	43	5	26
21	6	17	4		
n	180		179		179
m	19.361		15.223		4.140
σ	0.61		0.59		0.36
σ_m	0.046		0.044		0.027
σ_σ	0.032		0.031		0.019

Anal fin rays.						Keeled scales (K_2)		Ventr. rays		Rays in right pect.	
Total		Branched		Unbranched							
No.	Freq.	No.	Freq	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
16	7	13	5	2	8	12	4	16	10	16	9
17	22	14	30	3	154	13	69	17	16	17	53
18	94	15	94	4	18	14	87	18	143	18	77
19	51	16	45			15	20	19	7	19	33
20	6	17	6					20	4	20	3
n	180		180		180	n	180		180		175
m	18.150		15.094		3.056	m	13.683		17.883		17.817
σ	0.82		0.81		0.38	σ	0.70		0.65		0.086
σ_m	0.061		0.060		0.028	σ_m	0.052		0.049		0.065
σ_σ	0.043		0.043		0.020	σ_σ	0.037		0.034		0.046

An examination of the herrings from Drangar shows that they belong to different size groups. There is a maximum frequency at 28 cm, another maximum at 32—33 cm, and a minimum at 30—31 cm. If we regard the distribution of the specimens according to the number of winter rings in the scales (p. 8) it will be seen that proportionately few specimens occur with 5 winter rings. As the average length of the specimens with 5 winter rings must be supposed to lie at 30—31 cm the mentioned minimum is apparently due to the fact that a certain age group (1913) is only very scantily represented in the sample. An analysis has shown, that the specimens of the two size groups have practically the same number of vertebrae, keeled scales etc.

If we compare the numerical values found in the various characters examined in the two samples from Drangar and Eldey Bank we get the following result:

Eldey Bank, May 1919, minus Drangar, August 1919:

Diff. Vert. S.	+ 0.06	st. dev. of diff.		0.061
— prec. Vert	+ 0.03	- — - —		0.097
— caudal Vert.	+ 0.02	- — - —		0.100
— total dorsal rays	+ 0.02	- — - —		0.059
— branched dorsal rays	+ 0.02	- — - —		0.056
— unbranched	0.00	- — - —		0.036
— total anal fin rays	0.00	- — - —		0.078
— branched anal fin rays	— 0.03	- — - —		0.076
— unbranched - - -	+ 0.03	- — - —		0.036
— keeled scales (K_2)	— 0.16	- — - —		0.077
— ventral fin rays	+ 0.04	- — - —		0.061
— rays in right pectoral	— 0.15	- — - —		0.198

It will be seen that the herrings from the two samples show a close agreement with each other. Only for one single character (K_2) is the difference twice as great as the standard deviation. For the total number of vertebrae (Vert. S.) the difference is about equal to its standard deviation, and for the rest of the characters the differences are less than the standard deviations of these. The two samples thus belong to the same race which we, following Sæmundsson, name: The summer-spawning Icelandic herring.

It still remains to determine, how far the different age groups of the same race show the same numerical values for the characters investigated. Heincke considered the race invariable from one year to another[1]), but his proofs of such a stability were weak. By investigations of the stockof plaice

[1]) Fr. Heincke: Naturgeschichte des Herings. Abhandlungen d. deutschen Seefischerei-Vereins Bd. II. Heft I u. II. 1898.

in the Kattegat I have shown that specimens of two different age groups captured in the same locality may possess a different number of anal fin rays[1]). I was of opinion, that these specimens originated from quite different spawning places and thus belonged to different races, and this is probably correct. I noticed moreover, that among specimens of the same year brood, captured in the same locality, the bigger specimens possessed on an average a higher number of fin rays than the smaller ones. As it *in casu* was improbable that the bigger specimens should belong to another race than the smaller ones, I came to the conclusion that the number of fin rays is not determined solely by inheritance, but that the environments during a certain sensible period also influence the number of rays[1]). JOHS. SCHMIDT has more recently through his experiments with LEBISTES and ZOARCES found that external factors, such as temperature, may influence the number of fin rays, etc.[2]).

LEA has called attention to the fact that different age groups of herrings captured in the same locality may have a different number of vertebrae. Thus he has found the average number of vertebrae to be 57.72 in 241 herrings of $2^2/_3$ years captured at the coast of the northern Norway in the autumn of 1915, while he, at the same time, found that the number of vertebrae in 49 herrings at the age of $1^2/_3$ years was 57.37[3]). The difference was thus 0.35 and the standard deviation of the difference 0.11. It could, however, not be established whether the different age classes originated from the same spawning places and thus belonged to the same race or not.

I have found in the spring herring of the Limfiord (Jutland) that the average number of keeled scales is not quite the same in different years. Thus I found in May 1916 a mean number of keeled scales of 14.09 in 143 specimens of maturity V—VII, and on January 30th 1918 a mean number of 14.44 in 135 herrings of maturity IV—V[4]). The difference is here 0.35 and the standard deviation of the difference 0.08. Here was thus shown a real difference in the individually constant characters of herrings, which in all probability spawn in the same place and at the same time, and which, according to Heincke's definition should belong to the same race. There is therefore good reason to examine the different age classes of our material separately and to investigate whether differences should occur in the numerical values of the individually constant characters examined. According to the preceding statements we can hardly doubt that we have to deal here with specimens belonging to one and the same race (in Heincke's meaning). The analyses of each of the age classes give the following result:

Analyses of the various age groups.

Total number of vertebrae:

	Eldey Bank			Drangar			
Age group No.	1914	1912	1911	1915	1914	1912	1911
54	—	—	—	—	—	1	—
55	—	2	1	—	—	—	—
56	2	7	20	6	9	6	1
57	12	48	68	45	19	24	11
58	5	12	21	8	4	5	2
59	—	—	1	1	1	—	—
60	—	—	1	—	—	—	—
n	19	69	112	60	33	36	14
m	57.158	57.014	57.036	57.067	56.909	56.889	57.071
σ		0.63	0.72	0.55	0.72	0.75	
σ_m		0.076	0.068	0.071	0.126	0.125	
σ_σ		0.054	0.048	0.050	0.089	0.088	

[1]) A. C. JOHANSEN: Ueber die Schollenfischerei im Kattegat und die Mittel, sie zu heben. Rapports et Procès-Verbaux Vol. V. Cons. perm. internat. Copenhague 1906.

[2]) JOHS. SCHMIDT: Racial Investigations II. Comptes-Rendus des travaux du Laboratoire de Carlsberg. Vol. 14. No. 1 Copenhague 1917. Same: Racial Investigations V. ibid. Vol. 14 No. 9. Copenhague 1921.

[3]) EINAR LEA: Age and Growth of the Herring in Canadian waters. Canadian Fisheries Expedition 1914—15 under the direction of Dr. Johan Hjort. Ottawa 1919.

[4]) A. C. JOHANSEN: On the large spring-spawning sea-herring etc. 1919, p. 35.

Number of precaudal vertebrae.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Drangar 1915	Drangar 1914	Drangar 1912	Drangar 1911
22	—	1	—	—	—	1	—
23	2	7	12	3	3	4	—
24	5	23	40	27	17	13	3
25	8	23	37	21	13	8	3
26	4	12	15	7	—	8	7
27	—	3	7	1	—	1	1
28	—	—	1	—	—	1	—
29	—	—	—	1	—	—	—
n	19	69	112	60	33	36	14
m	24.737	24.681	24.714	24.667	24.303	24.694	25.429
σ		1.06	1.09	0.96	0.64	1.26	
σ_m		0.128	0.103	0.124	0.111	0.210	
σ_σ		0.091	0.073	0.088	0.078	0.149	

Number of caudal vertebrae.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Drangar 1915	Drangar 1914	Drangar 1912	Drangar 1911
28	—	—	—	1	—	—	—
29	—	—	1	—	—	1	—
30	—	3	6	1		1	2
31	2	11	16	6	1	9	5
32	9	26	38	21	14	11	4
33	6	19	35	26	15	8	2
34	2	9	16	5	3	5	1
35	—	1	—	—	—	1	—
n	19	69	112	60	33	36	14
m	32.421	32.333	32.321	32.400	32.606	32.194	31.643
σ		1.08	1.11	1.03	0.70	1.28	
σ_m		0.130	0.105	0.133	0.123	0.214	
σ_σ		0.092	0.074	0.094	0.087	0.151	

Total number of dorsal fin rays.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Drangar 1915	Drangar 1914	Drangar 1912	Drangar 1911
18	1	2	7	1	2	1	1
19	15	42	65	42	21	18	9
20	3	23	38	15	9	15	4
21	—	2	2	2	1	2	—
n	19	69	112	60	33	36	14
m	19.105	19.362	19.313	19.300	19.273	19.500	19.214
σ		0.59	0.62	0.56	0.63	0.66	
σ_m		0.071	0.058	0.072	0.109	0.109	
σ_σ		0.051	0.041	0.051	0.077	0.077	

Number of unbranched dorsal fin rays.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
3	—	1	3	—	—	—	1
4	16	51	97	53	29	29	12
5	3	17	12	7	4	6	1
n	19	69	112	60	33	35	14
m	4.158	4.232	4.080	4.117	4.121	4.171	4.000
σ		0.46	0.36	0.32	0.33	0.38	
σ_m		0.055	0.034	0.042	0.058	0.065	
σ_σ		0.039	0.024	0.030	0.041	0.046	

Number of branched dorsal fin rays.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
14	3	9	10	2	4	2	1
15	14	43	68	46	21	20	9
16	2	16	32	11	7	12	4
17	—	1	2	1	1	1	—
n	19	69	112	60	33	35	14
m	14.947	15.130	15.232	15.183	15.152	15.343	15.214
σ		0.64	0.63	0.50	0.67	0.64	
σ_m		0.077	0.059	0.065	0.116	0.108	
σ_σ		0.054	0.042	0.046	0.082	0.076	

Total number of anal fin rays.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
16	1	2	1	1	1	1	—
17	2	15	22	5	3	4	3
18	9	29	46	33	17	21	8
19	7	19	35	21	11	7	3
20	—	3	8	—	1	3	—
21	—	1	—	—	—	—	—
n	19	69	112	60	33	36	14
m	18.158	18.130	18.241	18.233	18.242	18.194	18.000
σ		0.95	0.88	0.67	0.79	0.86	
σ_m		0.115	0.083	0.087	0.138	0.143	
σ_σ		0.081	0.059	0.061	0.097	0.101	

Number of unbranched anal fin rays

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
2	—	—	1	2	2	2	1
3	17	62	95	51	29	30	12
4	2	7	16	7	2	4	1
n	19	69	112	60	33	36	14
m	3.105	3.101	3.134	3.083	3.000	3.056	3.000
σ		0.30	0.37	0.38	0.35	0.41	
σ_m		0.037	0.035	0.049	0.062	0.068	
σ_σ		0.026	0.025	0.035	0.044	0.048	

Number of branched anal fin rays.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
13	1	3	1	—	1	—	—
14	3	15	21	10	3	6	4
15	9	31	54	32	18	21	6
16	6	17	30	17	9	7	4
17	—	3	6	1	2	2	—
n	19	69	112	60	33	36	14
m	15.053	15.029	15.170	15.150	15.242	15.139	15.000
σ		0.89	0.83	0.71	0.83	0.76	
σ_m		0.107	0.078	0.092	0.145	0.127	
σ_σ		0.076	0.055	0.065	0.102	0.090	

Number of keeled scales (K_2).

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
12	2	7	13	2	—	2	—
13	6	27	45	18	11	20	6
14	9	33	40	28	20	12	8
15	2	1	12	12	2	2	—
16	—	—	1	—	—	—	—
n	19	68	111	60	33	36	14
m	13.579	13.412	13.486	13.833	13.727	13.389	13.571
σ		0.70	0.87	0.79	0.57	0.69	
σ_m		0.084	0.082	0.101	0.100	0.115	
σ_σ		0.059	0.059	0.072	0.071	0.081	

Number of fin rays in both ventral fins.

Age group No.	Eldey Bank 1914	Eldey Bank 1912	Eldey Bank 1911	Eldey Bank 1915	Drangar 1914	Drangar 1912	Drangar 1911
16	2	5	3	2	1	5	—
17	1	9	8	3	1	5	3
18	14	52	84	50	28	25	10
19	1	2	17	4	1	—	1
20	1	1	—	1	2	1	—
n	19	69	112	60	33	36	14
m	17.895	17.783	18.027	17.983	18.061	17.639	17.857
σ		0.68	0.58	0.57	0.66	0.88	
σ_m		0.082	0.055	0.073	0.115	0.147	
σ		0.058	0.039	0.052	0.081	0.104	

No. of fin rays in right pectoral.

Drangar

Age group No.	1915	1914	1912	1911
16	2	—	2	2
17	18	8	15	3
18	30	11	16	4
19	6	13	2	4
20	1	—	1	1
n	57	32	36	14
m	17.754	18.156	17.583	17.929
σ	0.76	0.81	0.81	
σ_m	0.101	0.143	0.134	
σ_σ	0.071	0.101	0.095	

It is obvious that in several cases there are small real differences between the various age groups as regards several of the characters investigated. This is e. g. the case with the age groups 1914 and 1912 from Drangar.

Drangar. Age group 1914 minus age group 1912.

Difference	caud. vert.	0.412	st. dev. of diff.	0.25
—	keeled scales (K_3)	0.338	— —	0.15
—	ventr. fin rays	0.422	— —	0.19
—	rays in right pect.	0.573	— —	0.20

The differences found for the various characters will be further treated in the following, where we have combined the various age groups from Eldey Bank and Drangar.

If we regard the total number of vertebrae (Vert. S.), it will be seen that the mean values for the different age classes deviate only very little from each other.

A consideration of each of the age groups for Eldey Bank together with Drangar give the following result:

Age group No.	1915	1914	1912	1911
54	—	—	1	—
55	—	—	2	1
56	6	11	13	21
57	45	31	72	79
58	8	9	17	23
59	1	1	—	1
60	—	—	—	1
n	60	52	105	126
m	57.067	57.000	56.971	57.040
σ	0.548	0.686	0.672	0.697
σ_m	0.071	0.095	0.066	0.062
σ_σ	0,050	0.067	0.046	0.044

It will be seen that the difference between the means is here considerably less than the st. dev. of the difference. An observation which I made on mature herrings from the Faroes suggests however that the number of vertebrae may vary a little from one age group to another[1]).

[1]) A. C. Johansen: The Atlanto-Scandian Spring-Herring (Clupea harengus L.) spawning at the Faroes. Medd. Kommissionen for Havundersøgelser Ser. Fiskeri Bd. VI. Nr. 4 1921.

With regard to precaudal vertebrae the difference for the various age groups is greater than for Vert. S. That character is on the whole more variable than Vert. S. The number is extraordinarily low for the series 1914 from Drangar. It is ca. 0.38 lower than for the total sample investigated from Eldey Bank plus Drangar (477 specimens), and the standard deviation of the difference is ca. 0.12. With regard to Eldey Bank the few investigated specimens from 1914 have, however, a rather high number of precaudal vertebrae. It is thus doubtful whether we dare attach any real importance to the low value of the proportionately few specimens of the year class 1914 from Drangar.

The various age classes for Eldey Bank plus Drangar show the following values:

Age group No.	1915	1914	1912	1911
22	—	—	2	—
23	3	5	11	12
24	27	22	36	43
25	21	21	31	40
26	7	4	20	22
27	1	—	4	8
28	—	—	1	1
29	1	—	—	—
n	60	52	105	126
m	24.667	24.462	24.686	24.794
σ	0.960	0.779	1.129	1.090
σ_m	0.124	0.108	1.110	0.097
σ_σ	0.078	0.076	0.078	0.069

The difference is greatest between the age groups 1914 and 1911, namely 0.332, and the standard deviation of the difference 0.142.

For the caudal vertebrae the difference between the means is not quite so great as for the precaudal vertebrae. The age group 1914 from Drangar also shews peculiarities here. The average number is ca. 0.24 lower than for the total population of Eldey Bank and Drangar (standard deviation of the difference ca. 0.13) and moreover σ is here extraordinarily small, viz. 0,704 $\pm$ 0.087, whilst we find for the other annual series, where more than 30 specimens are investigated, that the value for σ lies between 1.08 and 1,28. A combination of Eldey Bank and Drangar gives the following result:

Age group No.	1915	1914	1912	1911
28	1	—	—	—
29	—	—	1	1
30	1	—	4	8
31	6	3	20	21
32	21	23	37	42
33	26	21	27	37
34	5	5	14	17
35	—	—	2	—
n	60	52	105	126
m	32.400	32.538	32.286	32.246
σ	1.028	0.753	1.150	1.129
σ_m	0.133	0.104	0.112	0.101
σ_σ	0.094	0.074	0.079	0.071

The age classes 1914 and 1911 shew the greatest deviation, namely 0,292, with standard deviation of the difference 0.145.

In the total number of dorsal fin rays the various age classes do not shew great differences. The age class 1914 has at Eldey Bank as well as at Drangar a relatively low number of rays. If we add the specimens for Eldey Bank and Drangar together we obtain the following values.

Age group No.	1915	1914	1912	1911
18	1	3	3	8
19	42	36	60	74
20	15	12	38	42
21	2	1	4	2
n	60	52	105	126
m	19.300	19.212	19.410	19.302
σ	0.562	0.571	0.615	0.610
σ_m	0.072	0.079	0.060	0.054
σ_σ	0.051	0.056	0.042	0.038

The difference between the means for the age groups 1914 and 1912 is here 0.198, and the standard deviation of the difference 0.099.

With regard to the unbranched dorsal rays the age class 1911 has for Eldey Bank as well as for Dranger a relatively low number. If we add the specimens from the two localities, we obtain the following result:

Age group No.	1915	1914	1912	1911
3			1	4
4	53	45	80	109
5	7	7	23	13
n	60	52	104	126
m	4.117	4.135	4.212	4.071
σ	0.324	0.345	0.433	0.362
σ_m	0.042	0.048	0.043	0.032
σ_σ	0.030	0.034	0.033	0.023

The difference between the means for the annual series 1912 and 1911 is 0.141 with a standard deviation of the difference of 0.054. There is therefore a great probability that a real difference exists here between the two age classes.

For the branched dorsal fin rays the age class 1912 from Drangar shows a relatively high number, while the age class 1912 from Eldey Bank shews a somewhat lower number than normal. By addition of the specimens from the two localities we obtain the following values:

Age group No.	1915	1914	1912	1911
14	2	7	11	11
15	46	35	63	77
16	11	9	28	36
17	1	1	2	2
n	60	52	104	126
m	15.183	15.077	15.202	15.230
σ	0.504	0.621	0.644	0.621
σ_m	0.065	0.086	0.063	0.055
σ_σ	0.046	0.061	0.045	0.039

The difference in the means between the age groups 1914 and 1911 is 0.153, and the standard deviation of the difference 0.102.

The means for the total number of anal fin rays do no present any important deviations. Combining Eldey Bank and Drangar we obtain the following values:

Age group No.	1915	1914	1912	1911
16	1	2	3	1
17	5	5	19	25
18	33	26	50	54
19	21	18	26	38
20	—	1	6	8
21	—	—	1	—
n	60	52	105	126
m	18.233	18.212	18.152	18.214
σ	0.673	0.800	0.918	0.864
σ_m	0.087	0.111	0.090	0.077
σ_σ	0.061	0.078	0.063	0.054

The difference in the mean figures is highest between the broods 1915 and 1912, namely 0.081, and the standard deviation of the difference 0.125.

The difference in the number of unbranched anal fin rays of the different annual series is very small. An addition of the age groups gives the following values:

Age group No.	1915	1914	1912	1911
2	2	2	2	2
3	51	46	92	107
4	7	4	11	17
n	60	52	105	126
m	3.083	3.038	3.086	3.119
σ	0.381	0.341	0.343	0.371
σ_m	0.049	0.047	0.033	0.033
σ_σ	0.035	0.033	0.024	0.023

The difference here is greatest between the age classes 1914 and 1911, namely 0.081 with a standard deviation of the difference of 0.057.

For the branched anal fin rays the age group 1914 from Drangar contains a comparatively high number, while the age group 1914 from Eldey Bank has a relatively low number. By the addition of the specimens from the two localities we obtain the following values:

Age group No.	1915	1914	1912	1911
13	—	2	3	1
14	10	6	21	25
15	32	27	52	60
16	17	15	24	34
17	1	2	5	6
n	60	52	105	126
m	15.150	15.173	15.067	15.151
σ	0.709	0.834	0.858	0.820
σ_m	0.092	0.116	0.084	0.073
σ_σ	0.065	0.082	0.059	0.052

The difference is greatest between the age classes 1914 and 1912, namely 0.106 with a standard deviation of the difference of 0.143.

With regard to the keeled scales (K_2) the age classes 1915 and 1914 from Drangar shew a remarkably high number compared with the other age classes. The difference between the age groups 1915 and 1912 from Drangar is 0.444 and the st. dev. of the difference 0.153. If we add the age groups from Eldey Bank and Drangar together we obtain the following values:

Age group No.	1915	1914	1912	1911
12	2	2	9	13
13	18	17	47	51
14	28	29	45	48
15	12	4	3	12
16	—	—	—	1
n	60	52	104	125
m	13.833	13.673	13.404	13.496
σ	0.785	0.678	0.690	0.839
σ_m	0.101	0.094	0.068	0.075
σ_σ	0.072	0.066	0.048	0.053

The difference between the age classes 1915 and 1912 is here 0.429 and the st. dev. of the difference 0.122. A real difference thus obtains in the number of keeled scales of the specimens of two different age groups of the same race.

When a comparison between the whole sample of herrings from Eldey Bank and the whole sample of herrings from Drangar shewed that the latter sample possessed a higher number of keeled scales than the former (p. 9), it was essentially due to the fact that the age group 1915 was strongly represented at Drangar and almost wanting at Eldey Bank.

In the number of ventral fin rays there is a considerable difference between the various age groups. The age class 1912 shews at Drangar as well as at Eldey Bank a relatively low number of ventral fin rays. By adding the age groups from the two localities we obtain the following result:

Age group No.	1915	1914	1912	1911
16	2	3	10	3
17	3	2	14	11
18	50	42	77	94
19	4	2	2	18
20	1	3	2	—
n	60	52	105	126
m	17.983	18.000	17.733	18.008
σ	0.567	0.741	0.737	0.573
σ_m	0.073	0.103	0.072	0.051
σ_σ	0.052	0.073	0.051	0.036

The difference is highest between the age groups 1912 and 1911, namely 0.275, and the st. dev. of the difference is 0.088. There is thus here a real difference in the number of ventral fin rays of two age classes in the same race.

It seems probable that the number of rays in the right pectoral may also vary somewhat from one year to another. Between the age groups 1914 and 1912 there is a difference in the means of 0.573

and a st. dev. of the difference of 0.196. The number of specimens investigated is however rather small for both age groups, and the st. dev. of σ consequently relatively great.

For the characters stated below the highest difference observed between the different age classes: 1915, 1914, 1912 and 1911 in Eldey Bank plus Drangar is smaller than the standard deviation of the difference taken $1^1/_2$ times, and it has a numerical value of less than 0.11.

Total number of vertebrae.

Total number of anal fin rays.

Number of unbranched anal fin rays.

Number of branched anal fin rays.

For the following characters the highest difference observed between the age groups is between 1.5 and 2 times as high as the st. dev. of the difference and has a numerical value of between 0.15 and 0.2

Total number of dorsal fin rays.

Branched dorsal fin rays.

For the characters below the highest difference observed between the age groups is between 2 and 3 times as high as the standard deviation of the difference and has a numerical value of 0.14 to 0.33.

Number of precaudal vertebrae.

Number of caudal vertebrae.

Number of unbranched dorsal fin rays.

For the following characters the highest difference observed between the age classes is about 3 times as high as the standard deviation of the difference and has a numerical value of 0.27—0.57.

Number of keeled scales (K_2).

Number of ventral fin rays.

Number of rays in the right pectoral fin.

Two different circumstances may contribute to make the observed difference between the various age groups somewhat smaller than the real difference:

Firstly, errors in the age determinations caused by indistinct annual rings, and secondly the fact that in some specimens a distinct winter ring is probably formed in the scales already in their first year, whereas such a ring, does not, as far as we can judge at present, appear as a rule till their second year. This last reason will also cause errors in the age determinations.

Through the analyses, which we have carried out, we obtain a provisional basis for a judgment of how great the differences may be between the different age groups of specimens belonging to the same race. It is highly essential that investigations of this kind should be continued and extended to other areas. When we compare samples of herrings of the same race in different years, we generally deal with several different age groups, and the means for such samples, where several age groups are well represented, will rarely deviate significantly from each other. If on the contrary we deal with samples, each of them comprising only one single age group, or samples where one single age group is highly dominating, we may notice small real differences, at any rate with regard to some characters.

If we add together the investigated samples from Eldey Bank and Drangar, we get a total of 477 specimens. No single age group is highly dominating here, but four different age groups are rather well represented, with respectively 61, 52, 105 and 126 specimens. Thus it must be supposed that we have here a rather good average sample for the summer spawning herring at the coasts of Iceland. The addition gives the following results with regard to the characters examined:

Eldey Bank May 1919 plus Drangar August 1919

Vertebrae

	Vert. S.	Prec. Vert.		Caudal Vert.	
No.	Freq.	No.	Freq.	No.	Freq.
54	1	22	3	28	1
55	4	23	44	29	3
56	65	24	174	30	16
57	313	25	165	31	69
58	90	26	69	32	167
59	3	27	17	33	157
60	1	28	4	34	60
61		29	1	35	4
n	477		477		477
m	57.048		24.681		32.367
σ	0.648		0.937		1.070
σ_m	0.030		0.043		0.049
σ_σ	0.021		0.030		0.035

Anal fin rays.

	Total	Unbranched		Branched	
No.	Freq.	No.	Freq.	No.	Freq.
16	14	2	17	13	12
17	76	3	406	14	91
18	228	4	54	15	237
19	142			16	123
20	16			17	14
21	1				
n	477		477		477
m	18.153		3.078		15.075
σ	0.840		0.378		0.814
σ_m	0.038		0.017		0.037
σ_σ	0.027		0.012		0.026

Dorsal fin rays.

	Total	Unbranched		Branched	
No.	Freq.	No.	Freq.	No.	Freq.
18	23	3	9	14	41
19	269	4	392	15	291
20	170	5	75	16	136
21	15			17	8
n	477		476		476
m	19.371		4.139		15.233
σ	0.627		0.397		0.621
σ_m	0.029		0.018		0.028
σ_σ	0.020		0.013		0.020

	Keeled scales (K_2)	Ventral fin rays.		Rays in right pect.	
No.	Freq.	No.	Freq.	No.	Freq.
12	32	16	24	16	10
13	180	17	37	17	57
14	219	18	382	18	86
15	42	19	24	19	34
16	2	20	9	20	3
n	475		476		190
m	13.583		17.910		17.805
σ	0.762		0.631		0.848
σ_m	0.035		0.029		0.061
σ_σ	0.025		0.020		0.043

We shall proceed to undertake a comparison between the summer-spawning Icelandic herring and the large spring-spawning Atlanto-Scandian herring which occurs at Iceland, the Faroes and Norway. As representing the latter we shall choose first the sample in which the greatest number of the above named characters have been subjected to investigation. This is the case with a sample of mature herrings captured at Kongshavn, the Faroes, in the beginning of April, 1920 [1]. If we compare this herring with the summer spawning herring from Eldey Bank and Drangar we obtain the following result:

Spring Herring Kongshavn, April 1920, minus Summer Herring Eldey Bank and Drangar, 1919.

Diff. vert S.	+ 0.28	st. dev. of diff.	0.059
- prec. vert.	— 0.32	- - - -	0.084
- caudal vert.	+ 0.60	- - - -	0.090
- total dorsal rays	— 0.14	- - - -	0.060
- unbranched dorsal rays	— 0.05	- - - -	0.031
- branched - -	— 0.10	- - - -	0.057
Diff. total anal rays	— 0.04	st. dev. of diff.	0.074
- unbranched anal rays	— 0.01	- - - -	0.028
- branched - -	— 0.03	- - - -	0.072
- keeled scales K_2	+ 0.18	- - - -	0.076
- ventral fin rays	0.00	- - - -	0.046

[1]) A. C. Johansen: The Atlanto-Scandian Spring Herring (Clupea harengus L.) spawning at the Faroes: Meddelelser fra Kommissionen for Havundersøgelser. Serie Fiskeri Bd 6. No. 4. 1921 p. 3—4.

Next we shall undertake a comparison between the samples of summer-spawning herrings from Eldey Bank and Drangar and the largest of the samples of spring-spawning herrings at Iceland hitherto examined. The latter sample originates from Eyjafjord-District, North Iceland, September 1915. It is described in my paper: »On the large spring-spawning Sea Herring« p. 9. It is not known whether this sample is a pure unmixed sample of spring herrings, but it is certain that the majority at any rate are spring spawners. (The possibility is not excluded that the »recovering spents« or part of those in the sample in question may have been summer spawners, but these hardly amounted to $^1/_3$ of the specimens investigated).

Spring Herring Eyjafjord Sept. 1915 minus Summer Herring Eldey Bank, May 1919, and Drangar, August 1919.

Diff. vert. S.	+ 0.31	st. dev. of diff.	0.059
- prec. vert.	— 0.27	- - - -	0.075
- caudal vert.	+ 0.59	- - - -	0.080
- keeled scales (K_2)	+ 0.26	- - - -	0.064
- ventral fin rays	+ 0.02	- - - -	0.049

It will be seen from these surveys that there is a real difference between the samples of summer-spawning herrings from Iceland and the samples of spring-spawning herrings from the Faroes and Iceland. The greatest difference exists in the number of caudal vertebrae. The spring-spawning herring possess here the highest number. The numerical difference observed is ca. 0.6 and this difference is ca. 7 times as great as its standard deviation. The total number of vertebrae is also a little higher for the spring-spawning than for the summer-spawning herring. The difference is here ca. 0.3 and its standard deviation only ca. $^1/_5$ of this. The summer-spawning herring has on the contrary a higher number of precaudal vertebrae than the spring spawning herring. The difference is here ca. 0.3 and the standard deviation ca. $^1/_4$ of this value. The number of keeled scales of the summer herring is lower than that of the spring herring, but the difference here is in one case only a little more than twice the standard deviation, in the other case ca. 4 times as high. The differences observed are here, especially for the caudal vertebrae, distinctly higher than those which have been pointed out between the different age groups of the summer-spawning herring, in spite of the fact that we are comparing here samples comprising several different age groups [1]). Thus we may conclude that we have here to do with racial differences. It will be seen that the differences pointed out hold good if we compare the summer herring from Iceland with all the larger samples of the spring-spawning herring hitherto examined from the coasts of Norway. The Icelandic summer herring has a lower total number of vertebrae and a lower number of caudal vertebrae but relatively more precaudal vertebrae than the Norwegian spring herring, and it has also on an average a lower number of keeled scales than the Norwegian spring herring (Brock l. c. 1908, Johansen l. c. 1919). We have not been able to demonstrate any difference in the number of rays in the dorsal fin, the anal fin and the ventral fins in the two different herring races.

As I have mentioned previously (l. c. 1919) and as it will be seen from the surveys p. 6 and 8, the Icelandic summer herring attains a similar size as the Atlanto-Scandian Spring Herring. At the age of 10 years the specimens of these races have an average length of ca. 36 cm.

[1]) The three characters: Vert. S; prec. vert. and caudal vert. are more or less correlated with each other.

III. The distribution of the summer-spawning Icelandic Herring.

Sæmundsson states (l. c. 1908) that the summer-spawning Icelandic herring has spawning places from Eldey Bank (off Cap Reykjanæs) to Breidafjord at 60—100 fathoms' depth up to 20 miles from the shore. It appears from Sæmundsson's later observations, that this herring has spawning places also at the southern coasts of Iceland (Westmanna Isles, Drangar etc.).

These observations of Sæmundsson have been confirmed by Jespersen's information concerning the distribution of the larvae of the summer-spawning herring at the coasts of Iceland (Jespersen l. c. 1920)[1]).

Fig. 4. Occurrence of summer-spawning herrings off Iceland in July and August. — Mainly after Bj. Sæmundsson.

As mentioned before, summer-spawning herrings of maturity III, IV and V were captured at the southwest coast of Iceland (Eldey Bank) at the end of May (1919). A sample examined by Lea of summer-spawning herrings from Faxafloi was taken on June 3rd (1908), and the maturity of the specimens was as a rule III, more rarely III—IV[2]). This herring evidently lives for a longer time at the southwest and west coast, before the spawning takes place.

[1]) According to Jespersen larvae (8—16 mm length) of the spring-spawning Icelandic herring occurred in the month of April here and there on the whole stretch from Cape Snæfellsnæs on the west coast to Eystrahorn at the southwest coast. It is probable that the spring-spawning herring has spawning places here and there on the whole of this stretch. According to information kindly given by Sæmundsson a large lean spent herring occurs every year or most years in the first days of May at Eldey Bank west of Cap Reykjanæs and further north up to Snæfellsnæs at depths about 60—70 fathoms, where there is hard bottom in several places. I think it probable that this herring occurs here in the neighbourhood of its spawning places.

[2]) Johan Hjort: Report on Herring-Investigations until January 1910.
Publications de Circonstance. No. 53. Conseil perm. internat. Copenhague 1910.

As shown by JOHS. SCHMIDT the spring herring spawns only in the »warm water« at the southern and western coasts of Iceland, while a part of the pelagic larvae is carried by the current to the north and east coast, where they are further developed[1]). This transportation by the current evidently includes larvae of spring-spawning as well as of summer-spawning herrings. It will be seen on Jespersen's Chart showing the distribution of the herring larvae at the coasts of Iceland (l. c. 1920) that larvae of the summer-spawning herring are found in August so far north as off Isafjord Deep at ca. 66° 20′ N. Lat., and that large pelagic larvae of this herring occur in the month of April off the northeast and east coast.

Whether the summer-spawning herring — like the spring-spawning herring — undertakes, after spawning, extensive migrations to the northern and eastern coasts of Iceland, is still an open question. This can however be determined now, as the distinguishing marks between the spring-spawning and the summer-spawning herring are known. SÆMUNDSSON[2]) believes that by means of his scale-investigations he has been able to recognize summer-spawning herrings in his material from North Iceland, but according to Lea's investigations (Hjort l. c. 1910) the summer-spawning herrings at Iceland can not individually be distinguished from the spring-spawning ones by means of the relative size of the central area in the scales.

Up till now we find nothing which points in the direction that the summer-spawning Icelandic herring has a similar extensive distribution to the Atlanto-Scandian spring herring. As it will be seen from the following chapter, it is probable, that the summer-spawning herring, which occurs at the Färoes, belongs to another race than the Icelandic summer herring, and no summer-spawning sea herring has up till the present been found on the coasts of Norway.

IV. Does the Icelandic Summer Herring differ from the Faroe Summer Herring.

Dr. HJORT states in »Norsk Havfiske«[3]) second part p. 199, that in »Michael Sars'« fishing experiments in 1902 some herrings were captured on June 18th north-east of the Faroes, and one specimen whose length was 32.5 cm »spawned in a tub of thin formol in which it was placed«. In another locality N. E. of the Färoes at 62° 48′ N. Lat. 5° 37.5 W. Long. »Michael Sars« captured on June 11th 1902, 49 herrings with »sometimes large, sometimes small sexual organs«.

In a sample of herrings captured at Kongshavn on August 1919 and kindly sent to me by Dr. JOHS. SCHMIDT, a blood-herring occurred (maturity VII) which had evidently spawned quite recently.

There is no doubt therefore that a summer-spawning herring occurs at the Faroes, and the maturity of the above mentioned herrings from June 18th 1902 and August 16th 1919 speaks strongly for the belief that this herring spawns at the Faroes, though its eggs and larvae have not yet been found at these Islands.

This summer-spawning Faroe herring has not yet been subjected to systematic race studies. There is however the probability that I came across this herring in a sample of young herrings, which were captured at Kongshavn on August 16th 1919, and from which the blood herring before mentioned was taken. The sample consisted of 124 specimens showing the following distribution according to size and sex:

[1]) JOHS. SCHMIDT: Fiskeriundersøgelser ved Island og Færøerne i Sommeren 1903. Skrifter udg. af Kommissionen for Havundersøgelser No. 1. København 1904.

[2]) BJARNI SÆMUNDSSON: Skyrsla til Stjörnarráðsins. Andvari 1911—12 and 1913—14.

[3]) Norges Fiskerier I. Bergen 1915. Udgivet af Selskabet for de nordiske Fiskeriers Fremme.

Length cm	♂	♀	♂ + ♀
20	2	2	4
21	12	11	23
22	7	6	13
23	2	—	2
24	1	—	1
25	12	11	23
26	20	12	32
27	10	13	23
28	1	1	2
30	—	1	1
Number:	67	57	124

Of the specimens 123 were of Maturity I—II and 1 of mat. VII. The distribution of specimens according to number of winter rings and length was as follows.

Herrings. Kongshavn, 16 August 1919.

Length in cm		20	21	22	23	24	25	26	27	28	29	30	Total No. of specimens	Average length cm	+ 0,5 cm
Age group	No. of winter-rings														
1917	1	4	15	5	2	—	—	—	—	—	—	—	26	21,24	21,74
1916	2	—	4	5	—	1	16	17	14	—	—	—	57	25,23	25,73
1915	3	—	—	—	—	—	3	11	7	1	—	—	22	26,27	26,77
1914	4	—	—	—	—	—	—	—	1	1	—	—	2	27,50	28,00
1913	5	—	—	—	—	—	—	—	—	—	—	1	1	30,00	30,50
	1—2	—	2	—	—	—	—	—	—	—	—	—	2	21,00	21,50
	2—3	—	—	1	—	—	1	2	1	—	—	—	5	25,20	25,70
	?	—	2	2	—	—	3	2	—	—	—	—	9	23,67	24,17
No. of specimens of each length		4	23	13	2	1	23	32	23	2	—	1	124	—	—

The numerical values found for the individual constant characters were as follows:

Vertebrae.

Vert. S.		Prec. Vert.		Caud. Vert.	
No.	Freq.	No.	Freq.	No.	Freq.
53	1	22	2	30	3
54	1	23	14	31	13
55	1	24	53	32	42
56	25	25	46	33	48
57	74	26	9	34	17
58	22			35	1
n	124		124		124
m	56.903		24.371		32.532
σ	0.78		0.84		0.97
σ_m	0.070		0.075		0.087
σ_σ	0.050		0.053		0.061

Dorsal fin rays.

Total		Unbranched		Branched	
No.	Freq.	No.	Freq.	No.	Freq.
18	2	4	88	14	16
19	73	5	36	15	78
20	46			16	30
21	3				
n	124		124		124
m	19.403		4.290		15.113
σ	0.57		0.46		0.60
σ_m	0.051		0.041		0.054
σ_σ	0.036		0.029		0.038

Anal fin rays.

Total No.	Total Freq.	Unbranched No.	Unbranched Freq.	Branched No.	Branched Freq.
16	1	2	7	14	23
17	26	3	116	15	58
18	56			16	40
19	38			17	2
20	2				
n	123		123		123
m	18.114		2.943		15.171
σ	0.78		0.23		0.74
σ_m	0.070		0.021		0.067
σ_σ	0.050		0.015		0.047

Keeled scales K_2. Ventr. fin rays.

No.	Freq.	No.	Freq.
12	5	16	7
13	36	17	8
14	63	18	109
15	17		
16	3		
n	124		124
m	13.815		17.823
σ	0.81		0.51
σ_m	0.073		0.046
σ_σ	0.051		0.032

It will be seen that this herring differs distinctly from the Atlanto-Scandian herring, among other characters by its lower number of caudal vertebrae and Vert. S., (Johansen l. c. 1919), whilst it shows greater resemblance to the Icelandic summer herring. A comparison between the sample in question from Kongshavn and the samples of the Icelandic summer herring from Eldey Bank and Drangar (p. 20) gives the following result:

Kongshavn August 1919 minus Eldey Bank Maj 1919 and Drangar August 1919.

Diff. Vert. S.	— 0,15	st. dev. of diff.		0.076
— prec. Vert.	— 0,31	- — - —		0.086
— caudal Vert.	+ 0,16	- — - —		0.100
— total dorsal rays	+ 0.03	- — - —		0.059
— unbranched dorsal rays	+ 0.15	- — - —		0.045
— branched — —	— 0.12	- — - —		0.061
— total anal rays	— 0.04	- — - —		0.080
— unbranched anal rays	— 0.14	- — - —		0.027
— branched — —	+ 0.10	- — - —		0.077
— keeled scales (K_2)	+ 0.23	- — - —		0.081
— ventral fin rays	— 0.09	- — - —		0.054

It will be seen that although there is much resemblance between these herrings there is a real difference in the number of precaudal vertebrae and in the number of unbranched dorsal fin rays and unbranched anal fin rays. If we consider that each of the samples compared, when taken separately, includes a considerable number of specimens of several different age groups, and that the observed differences, are not quite inconsiderable, we doubtles may venture to conclude that we have here to do with racial differences. The three age groups, which are rather well represented in the sample from Kongshavn (August 1919) appear moreover to be rather uniform with regard to the characters examined.

If we regard the length of the specimens in proportion to the number of the winter rings, it will be seen, that the specimens with two winter rings comprise two different size groups. The idea presents itself that the herrings of a length of 21 and 22 cm might be spring herrings, and the specimens of 24—27 cm summer-spawning herrings. An examination of the investigated characters gives no basis, however, for such a view (see General Survey C p. 35).

The nearest possibility seems to be that the sample from Kongshavn, 1919, originated from the summer-spawning herring which occurs at the Faroes and probably spawns here, but only a further investigation of mature specimens of this herring can solve this question. The sample in question cannot be a mixture of Icelandic summer herrings and Atlanto-Scandian spring herrings. The total number of vertebrae in the sample is for instance too low. The possibility is on the other hand not excluded, that the young herring mentioned might originate partly or entirely from the Shetland herring, the racial peculiarities of which have not yet been clearly demonstrated.

From the Shetland summer herring the sample differs considerably, among other characters by a higher number of precaudal vertebrae and a lower number of keeled scales (Broch 1908, Johansen 1919).

There is a possibility that the spawning time for the summer herring occurring at the Faroes extends over the months July, August, September, just as for the Shetland summer herring.

Lea has, in samples of herring captured in the fiords of the Faroes in September 1909, found some specimens, the maturity of which is stated to be IV and V (Hjort l. c. 1910), and I have in a sample from Kongshavn September, 1915 observed a few females of maturity IV—V (Johansen l. c. 1919). There is some reason to suppose, that we have here to deal with specimens with spawning time in September.

In the samples mentioned above of herrings from the fiords of Faroes from September 1910 Lea noted in most of the specimens a maturity of III, III—IV and IV. It is not clear whether these specimens would have spawned in the same autumn or in the following spring. In these herrings as well as in the specimens of maturity IV—V and V Lea found on an average a very large central area in the scales. Judging from the relative size of the central areas the average size of the specimens was thus calculated to be ca. 13 cm at the formation of the first winter ring. We have, however, found by experience in Danish waters that the first winter ring in scales of young herrings originating from spring-spawners may be very indistinct and may easily be overlooked. We must in any case take it for granted that specimens whose maturity is stated to be III and IV have not been very near the spawning time. If they should be autumn-spawning herrings, these would come to spawn late in autumn, and their larvae would in this case occur pelagically at the Faroes in the following spring. Such larvae of autumn spawning herrings have, however, not hitherto been captured at the Faroes.

General Survey of the Analyses of summer-spawning Herrings from Iceland and the Faroes. The letter r at the figure denoting number of winter rings means that the last winter ring is situated quite at the margin, not inside the margin.

A. Herrings from Eldey Bank, S. W. Iceland. End of May 1919. Maturity III—V. Caught in drift nets.

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
1	31.2	♂	35	V	24	33	57	12	4+16	3+15	—	10	10	ca. 8 r
2	32.2	♂	38	V	24	33	57	14	4+15	3+14	—	9	9	7 r
3	33.8	♀	—	IV	26	31	57	14	5+15	3+15	—	9	9	ca. 8 r
4	30.6	♀	—	IV	25	32	57	14	4+15	3+16	—	9	9	4 r
5	35.5	♂	26	V	25	32	57	13	4+15	3+15	—	9	9	11 r
6	34.5	♀	—	IV	24	34	58	13	4+15	3+14	—	9	9	6 r
7	32.5	♀	—	IV	25	32	57	14	4+15	3+14	—	8	8	6 r
8	32.2	♂	33	V	25	32	57	13	4+16	3+16	—	9	9	7 r
9	35.5	♀	—	IV	25	32	57	14	3+16	3+16	—	9	10	10 r
10	34.3	♀	—	IV	24	33	57	15	4+17	3+15	—	9	9	9 r
11	34.6	♂	23	V	23	35	58	14	4+16	3+15	18	9	9	8 r
12	33	♂	30	V	26	31	57	14	4+15	2+15	—	9	9	ca. 7 r
13	34.3	♂	27	V	25	32	57	14	4+15	3+15	—	9	9	ca. 9 r
14	29.5	♂	22	V	25	32	57	13	4+15	3+16	—	9	9	4 r
15	34.3	♂	26	V	25	32	57	14	4+15	3+15	—	9	9	7 r
16	36.3	♂	27	V	24	33	57	15	4+16	3+16	—	9	9	ca. 11 r
17	33	♀	—	III	26	32	58	14	4+16	3+15	—	9	9	7 r
18	33.2	♀	—	IV	27	31	58	15	4+15	3+16	—	9	9	7 r
19	33.6	♀	—	III—IV	25	33	58	15	5+14	3+15	—	9	9	4 r
20	34.1	♀	—	IV	25	32	57	13	4+15	3+14	—	9	8	6 r
21	32.6	♀	—	III—IV	26	32	58	13	4+14	3+14	—	9	9	7 r
22	31.6	♀	—	IV	23	34	57	13	5+14	3+14	—	9	9	5 r
23	31.7	♂	32	V	26	30	56	14	4+15	4+14	—	9	9	7 r
24	32.8	♀	—	IV	24	31	55	14	4+16	3+16	—	9	9	6 r
25	36	♂	30	V	24	33	57	14	5+15	3+17	—	9	10	ca. 7 r
26	34.4	♀	—	IV	23	34	57	12	4+15	3+15	—	8	9	7 r
27	34.5	♂	35	V	25	31	56	13	4+16	3+15	—	9	9	7 r
28	35.5	♀	—	IV	24	33	57	13	5+14	3+16	—	9	9	?
29	34.2	♀	—	IV	25	33	58	14	4+16	3+15	—	9	9	8 r
30	34.9	♂	33	V	24	34	58	15	4+16	3+15	—	9	9	ca. 11 r
31	32.3	♂	26	V	25	32	57	14	4+15	3+14	—	9	9	6 r
32	33.7	♀	—	IV	23	34	57	13	4+15	3+15	—	9	9	7 r
33	33.3	♀	—	IV	24	33	57	13	4+15	3+16	—	9	9	7 r
34	34.4	♀	—	IV	24	32	56	12	4+16	3+15	—	9	9	7 r
35	33.2	♂	32	V	24	33	57	14	4+15	3+15	—	9	9	7 r
36	34	♀	—	IV	25	33	58	13	4+16	3+17	—	9	9	ca. 10 r
37	35	♀	—	IV	28	30	58	14	5+14	3+15	—	9	9	ca. 10 r
38	33.5	♀	—	IV	25	32	57	12	4+15	3+15	—	9	9	6 r
39	30	♀	—	IV	25	32	57	12	4+15	3+15	—	9	9	4 r
40	34.2	♂	32	V	24	33	57	14	4+15	4+15	—	9	9	7 r
41	33.5	♂	29	V	25	33	58	14	5+15	3+16	—	9	9	7 r
42	32.2	♂	34	V	24	33	57	13	4+16	4+15	—	9	9	6 r—7 r
43	33.5	♂	30	V	24	33	57	13	4+15	3+15	—	9	9	7 r
44	35	♂	32	V	25	32	57	14	4+16	3+17	—	9	9	7 r
45	33.3	♂	25	V	26	32	58	?	4+16	3+15	—	9	9	6 r
46	31.9	♀	—	III—IV	25	33	58	14	4+15	3+16	—	8	8	4 r
47	32.5	♂	29	V	24	33	57	14	4+15	3+16	—	9	9	ca. 6 r
48	32.1	♂	27	V	26	30	56	12	4+16	3+16	—	9	9	7 r
49	34	♂	30	V	26	31	57	15	4+16	3+15	—	9	9	6 r
50	33.5	♂	26	V	25	32	57	12	4+15	3+15	—	9	8	5 r
51	33.3	♀	—	IV	25	32	57	14	4+16	3+16	—	9	9	7 r
52	33.5	♂	30	V	24	33	57	13	4+15	3+16	—	9	10	7 r
53	32.2	♂	23	V	26	31	57	13	4+15	3+15	—	9	9	6 r
54	34.8	♂	26	V	26	32	58	15	4+16	3+15	—	9	9	ca. 8 r

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
55	33.6	♀	—	IV	24	32	56	13	4+14	3+15	—	9	9	6 r
56	33.7	♀	—	IV	25	32	57	13	4+16	3+15	—	9	9	6 r
57	34	♀	—	IV	27	31	58	14	4+15	3+15	—	9	9	7 r
58	33.5	♂	30	V	25	32	57	14	5+16	4+14	—	10	9	ca. 8 r
59	32.8	♂	26	V	24	32	56	14	4+16	3+14	—	9	9	7 r
60	33.2	♂	33	V	23	34	57	14	4+16	3+16	—	9	9	5 r
61	33	♂	26	V	25	33	58	13	4+15	3+15	—	9	9	7 r
62	32.8	♀	—	IV	24	33	57	13	4+15	3+15	17	10	9	7 r
63	33.5	♀	—	III—IV	24	33	57	14	5+15	4+14	—	9	9	ca. 9
64	37.7	♀	—	IV	24	33	57	14	4+15	3+15	—	9	9	ca. 13 r
65	33.7	♀	—	IV	23	33	56	14	4+16	3+15	18	9	9	7 r
66	30.7	♂	30	V	23	33	56	12	4+15	3+16	—	9	9	4 r
67	33.2	♀	—	IV	24	34	58	13	4+16	3+15	17	9	9	7 r
68	32.3	♂	28	V	25	32	57	14	4+15	3+13	—	8	9	5 r
69	33.8	♀	—	IV	25	32	57	14	4+15	3+14	—	8	8	8 r
70	33.8	♀	—	III	25	33	58	15	3+15	3+16	—	9	9	7 r
71	33.4	♀	—	IV	25	31	56	14	4+15	4+15	—	9	9	7 r
72	32.8	♀	—	IV	25	32	57	13	4+16	3+14	—	9	9	7 r
73	28.5	♀	—	IV	25	32	57	14	4+15	3+16	—	9	9	7 r
74	34.8	♀	—	IV	26	31	57	13	4+16	4+15	—	9	9	7 r
75	32.2	♂	26	V	25	32	57	13	4+16	3+15	—	9	9	7 r
76	34.5	♀	—	IV	23	34	57	14	4+16	3+16	—	9	9	9 r
77	32	♂	37	V	25	32	57	13	5+14	3+15	—	9	9	6 r
78	31.4	♀	—	IV	24	33	57	14	4+16	3+14	—	9	9	7 r
79	35.1	♂	20	V	24	33	57	14	5+15	3+15	—	9	9	7 r
80	33.8	♀	—	IV	25	32	57	13	4+15	3+13	—	8	8	ca. 7 r
81	32.5	♀	—	III—IV	24	32	56	15	4+15	3+15	—	9	9	7 r
82	38	♀	—	IV – V	25	33	58	14	4+15	3+14	—	9	9	ca. 13 r
83	32.8	♂	35	V	25	32	57	14	4+16	3+16	—	9	9	8 r
84	33.9	♀	—	IV	25	32	57	14	4+15	4+16	—	9	9	7 r
85	33	♀	—	IV	25	32	57	14	4+15	3+15	—	9	9	6 r
86	30	♂	25	V	26	31	57	14	4+15	4+15	—	9	9	4
87	36.2	♀	—	IV	24	33	57	13	4+16	3+16	—	9	9	ca. 12 r
88	37	♂	32	V	23	34	57	14	4+15	3+15	—	9	9	ca. 11 r
89	33.5	♂	26	V	25	32	57	12	4+16	3+16	—	9	9	7 r
90	35.5	♀	—	IV	24	32	56	13	4+14	3+14	—	9	9	7 r
91	32.5	♂	24	V	24	34	58	14	4+15	3+14	—	9	9	7 r
92	30	♀	—	III—IV	23	34	57	15	4+14	3+13	—	9	9	4
93	33.4	♀	—	IV	24	33	57	15	4+16	3+14	—	9	9	7 r
94	34.5	♀	—	IV	25	32	57	14	5+16	3+15	—	9	9	?
95	32.6	♂	24	V	27	31	58	13	4+15	3+15	—	9	9	ca. 7 r
96	35.7	♂	36	V	24	33	57	13	4+15	3+15	—	9	9	8 r
97	33.1	♀	—	IV	25	32	57	14	4+15	3+15	—	9	9	6 r
98	34.3	♂	39	V	25	32	57	13	4+16	4+15	—	9	9	ca. 9 r
99	32.5	♂	33	V	25	33	58	14	4+16	3+14	—	9	9	?
100	35.2	♀	—	IV	26	31	57	14	4+15	4+15	—	9	9	ca. 12 r
101	33	♂	30	V	24	33	57	13	4+15	3+14	—	9	9	7 r
102	33.1	♂	32	V	25	32	57	14	4+15	3+17	—	9	9	6 r
103	34	♂	33	V	23	34	57	12	5+15	3+16	—	9	9	ca. 7 r
104	32.5	♂	31	V	26	31	57	12	4+16	4+16	—	8	8	6 r
105	32.6	♀	—	IV	23	32	55	14	4+14	3+15	—	9	9	7 r
106	33.8	♂	34	V	25	33	58	13	4+16	3+15	—	9	9	6 r
107	31.7	♀	—	III—IV	25	32	57	14	4+15	4+17	—	9	9	6 r
108	32.9	♀	—	IV	24	33	57	12	5+15	3+15	—	9	9	6 r
109	32.1	♂	29	V	25	33	58	14	5+15	3+15	—	9	9	6 r
110	30.7	♂	21	V	25	33	58	14	4+15	3+16	—	9	9	ca. 6 r
111	33.1	♀	—	IV	24	33	57	13	5+14	3+15	—	9	9	ca. 7 r
112	34.5	♀	—	IV	22	35	57	13	5+15	3+15	—	9	9	ca. 10 r
113	36.2	♂	32	V	24	33	57	14	4+15	3+15	—	9	9	ca. 11 r

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
114	35.7	♂	30	V	24	32	56	14	5+15	4+15	—	8	8	ca. 11 r
115	33.2	♂	28	V	25	32	57	13	5+15	4+15	—	9	9	7 r
116	30.4	♂	24	V	24	33	57	13	4+16	3+15	—	9	9	4 r
117	32.6	♀	—	IV	25	32	57	12	4+15	4+14	—	9	9	7 r
118	35.2	♂	34	V	25	33	58	14	5+15	3+16	—	9	9	10 r
119	32.5	♂	27	V	26	31	57	13	4+15	3+14	18	9	9	4 r
120	32.5	♀	—	IV	26	31	57	14	4+16	3+16	—	9	9	6 r
121	31.5	♂	27	V	25	32	57	13	4+15	3+15	—	9	8	ca. 4 r
122	33	♂	35	V	25	32	57	15	3+16	3+15	—	8	8	7 r
123	35.8	♂	29	V	24	33	57	14	3+15	2+15	—	9	9	10 r
124	31.9	♂	27	V	24	32	56	14	4+15	3+14	—	9	9	6 r
125	35	♀	—	IV	24	33	57	14	4+16	3+16	—	9	10	ca. 10 r
126	35.3	♂	36	V	24	33	57	14	4+16	3+16	—	9	9	ca. 10 r
127	32.2	♂	25	V	24	33	57	14	5+14	3+15	18	9	9	5 r
128	34	♂	27	V	23	34	57	14	4+15	4+15	—	9	9	ca. 8 r
129	31	♀	—	IV	24	33	57	14	5+14	3+15	—	9	9	4 r
130	33.3	♀	—	IV	25	31	56	13	4+15	3+15	—	9	9	6 r
131	33.7	♀	—	IV	24	32	56	13	4+15	3+15	—	9	9	ca. 7 r
132	33.4	♂	24	V	27	31	58	13	4+16	4+15	—	9	9	7 r
133	34.8	♂	33	V	25	31	56	13	4+15	3+15	—	10	10	?
134	32.5	♀	—	IV	24	33	57	13	4+15	4+15	—	9	9	ca. 6 r
135	32.6	♀	—	IV	26	31	57	13	4+15	3+16	16	9	9	?
136	31.9	♂	31	V	25	32	57	14	5+16	3+13	—	9	9	?
137	33.6	♀	—	III—IV	24	32	56	14	5+14	3+16	—	9	9	6 r
138	33.3	♂	26	V	24	33	57	14	5+16	3+15	19	9	9	6 r
139	33.3	♂	30	V	25	32	57	13	4+15	3+14	—	9	9	7 r
140	33.8	♀	—	IV	25	32	57	14	4+15	3+17	—	9	8	ca. 7 r
141	35.4	♂	30	V	26	32	58	15	4+15	3+15	—	?	9	8 r
142	33.6	♀	—	IV	24	34	58	14	4+16	3+15	—	9	9	7 r
143	34.5	♀	—	IV	25	32	57	14	4+15	3+14	—	9	9	7 r
144	32	♀	—	IV	26	30	56	14	5+15	3+15	—	9	10	?
145	32.5	♀	—	IV	24	32	56	15	4+15	3+15	—	9	9	7 r
146	32.5	♂	28	V	25	32	57	13	4+16	3+15	17	9	9	7 r
147	33.4	♂	25	V	26	32	58	12	5+14	3+15	—	8	8	6 r
148	33.5	♀	—	IV	24	33	57	14	5+15	3+14	—	9	9	7 r
149	32.5	♀	—	IV	24	33	57	14	4+15	3+14	—	9	9	6 r
150	33.6	♂	28	V	27	30	57	13	4+15	3+16	—	9	9	6 r
151	30.7	♂	31	V	25	32	57	14	4+16	3+16	—	9	9	4 r
152	33.3	♂	15	IV	24	33	57	14	4+14	3+14	—	9	9	7 r
153	33.6	♀	—	IV	26	31	57	14	4+16	3+16	—	9	9	7 r
154	29.5	♂	24	V	24	33	57	13	4+15	3+15	—	9	9	7 r
155	35.5	♂	34	V	24	34	58	15	4+16	3+14	—	8	8	ca. 10 r
156	32.6	♂	23	V	24	33	57	13	4+16	3+15	—	9	8	6 r
157	33.2	♂	30	V	24	33	57	14	4+15	3+16	—	9	10	7 r
158	32	♂	25	V	25	32	57	13	4+15	3+15	—	9	9	6 r
159	32	♂	29	V	27	29	56	13	4+15	3+14	—	8	9	7 r
160	34	♂	30	V	23	33	56	14	4+15	3+14	—	9	10	7 r
161	32.7	♂	34	V	26	31	57	14	4+15	3+15	—	9	9	8 r
162	34.3	♀	—	IV	26	31	57	14	4+15	3+14	—	9	9	7 r
163	32.5	♂	29	V	25	32	57	14	5+14	4+15	—	9	8	6 r
164	33.7	♂	28	V	26	31	57	14	5+16	4+15	—	8	8	?
165	33	♀	—	III—IV	25	32	57	14	5+15	3+16	—	9	9	6 r
166	36	♀	—	III—IV	24	33	57	14	4+15	3+14	—	9	9	8 r
167	31.6	♂	32	V	23	33	56	14	5+15	3+13	—	9	9	6 r
168	34.5	♀	—	IV	24	33	57	14	3+16	3+15	—	8	9	7 r
169	32.6	♀	—	IV	24	34	58	14	4+16	3+15	—	9	9	5 r
170	32.3	♂	28	V	26	31	57	14	4+15	3+14	—	9	10	6 r
171	33.5	♀	—	IV	25	33	58	14	4+16	3+15	—	9	9	6 r
172	32.7	♂	26	V	26	31	57	13	5+14	3+13	—	8	8	6 r

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
173	33	♀	—	IV	24	32	56	13	4+15	4+15	—	9	9	ca. 8 r
174	33.7	♂	31	V	25	32	57	12	3+16	2+16	—	9	9	ca. 8 r
175	33.1	♂	25	V	25	32	57	13	4+15	3+15	—	9	9	6 r
176	35.2	♀	—	IV	25	32	57	13	4+15	3+15	—	9	9	ca. 8 r
177	33.5	♂	30	V	27	30	57	13	4+15	4+15	—	8	9	6 r
178	34	♂	14	IV	23	34	57	16	4+15	3+15	—	9	9	7 r
179	33.2	♂	31	V	24	34	58	13	4+15	3+16	—	9	9	6 r
180	32.3	♂	28	V	26	31	57	13	4+16	3+16	—	9	9	6 r
181	34.2	♂	32	V	24	34	58	13	4+15	3+16	—	9	9	8 r
182	36	♂	30	V	25	32	57	14	4+16	3+14	18	9	9	ca. 10 r
183	32	♂	29	V	23	34	57	15	4+15	3+14	—	9	9	7 r
184	33	♀	—	IV	24	34	58	14	4+15	4+15	—	8	8	7 r
185	33.5	♂	30	V	25	32	57	12	4+15	3+15	—	9	9	6 r
186	31.8	♂	26	V	23	34	57	13	4+15	3+14	—	9	9	ca. 7 r
187	31.6	♂	23	V	24	33	57	14	4+15	3+15	—	9	9	6 r
188	33.8	♀	—	IV	24	34	58	14	4+14	3+17	—	8	9	6 r
189	33.1	♀	—	IV	23	34	57	14	4+16	3+16	—	9	9	6 r
190	31	♂	30	V	24	33	57	13	4+15	3+14	—	9	9	ca. 7 r—8 r
191	33.5	♂	27	V	25	32	57	12	4+16	3+15	—	9	9	?
192	35.1	♀	—	IV	24	33	57	14	4+16	3+14	—	9	9	8 r
193	32.5	♂	26	V	25	32	57	14	4+15	3+15	—	9	9	7 r
194	32.6	♀	—	IV	25	32	57	13	4+16	3+16	—	9	10	ca. 10 r
195	33.2	♂	33	V	24	33	57	13	5+15	3+15	—	9	9	6 r
196	29.2	♂	25	V	24	34	58	14	4+15	3+15	—	9	10	4 r
197	33.4	♂	25	V	25	32	57	12	4+15	3+14	—	9	9	ca. 6 r
198	35.8	♂	32	V	26	32	58	13	4+16	3+15	—	9	9	ca. 9 r
199	36.1	♂	30	V	27	31	58	13	4+15	3+15	—	9	9	ca. 8 r
200	33.1	♂	29	V	24	33	57	14	4+15	3+14	18	9	9	5 r
201	33.5	♂	31	V	27	30	57	13	4+16	3+16	-	9	9	7 r
202	36.2	♂	32	V	25	32	57	13	4+16	3+15	—	9	10	ca. 10 r
203	36	♂	28	V	25	32	57	12	4+14	4+14	—	9	9	7 r
204	32.8	♂	27	V	26	32	58	14	5+14	4+13	—	9	9	6 r
205	34	♀	—	IV	24	32	56	13	5+15	3+16	—	10	10	4 r
206	33.2	♂	24	V	26	31	57	13	4+15	3+14	—	9	9	6 r
207	33.7	♀	—	IV	25	33	58	14	4+16	2+16	—	9	9	?
208	32	♂	32	V	23	34	57	14	4+15	3+14	—	9	8	6 r
209	33	♀	—	IV	25	32	57	13	3+16	3+16	18	9	9	6 r
210	37	♀	—	IV	24	34	58	14	3+15	2+14	18	9	9	ca. 11 r
211	34	♀	—	IV	26	32	58	14	4+14	3+15	—	9	9	5 r
212	32	♂	36	V	24	33	57	13	4+15	3+15	—	9	9	7 r
213	33	♂	31	V	25	32	57	14	5+14	3+15	—	9	9	7 r
214	33.6	♂	27	V	25	33	58	15	5+14	3+15	—	9	9	7 r
215	36.8	♂	35	V	23	33	56	13	4+15	3+16	—	9	9	ca. 10 r
216	35.2	♀	—	IV	25	33	58	14	5+15	4+14	—	9	8	ca. 10 r
217	34.2	♂	44	V	24	32	56	14	4+16	3+15	—	9	9	6 r
218	34.7	♂	34	V	26	31	57	13	4+16	3+15	—	9	9	?
219	36.5	♂	37	V	24	33	57	15	4+16	3+15	—	9	9	ca. 14 r
220	33	♂	29	V	26	31	57	13	4+15	3+16	—	9	9	5 r
221	33.6	♀	—	IV	24	33	57	14	4+16	3+15	—	9	9	9 r
222	34.4	♀	—	IV	24	32	56	13	4+16	3+16	—	9	9	9 r
223	34.1	♀	—	IV	26	31	57	15	4+15	4+15	—	9	9	7 r
224	32.5	♂	27	V	25	32	57	14	4+15	3+14	—	9	9	6 r
225	33.8	♀	—	IV	26	31	57	13	4+15	3+15	—	9	9	8 r
226	29.9	♂	20	V	26	32	58	14	4+15	3+15	—	9	9	4 r
227	33.5	♂	28	V	25	32	57	14	4+15	3+15	—	9	9	8 r
228	33	♂	26	V	24	33	57	14	4+15	3+16	—	9	9	7
229	34.7	♀	—	IV	26	31	57	14	4+15	2+15	—	9	10	ca. 9 r
230	32.6	♂	30	V	23	32	55	16	5+15	3+14	—	9	9	ca. 10 r—12 r
231	35.1	♀	—	IV	23	34	57	14	4+15	4+14	—	9	9	6 r

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
232	32.6	♂	43	V	24	33	57	13	5+15	3+16	—	9	9	6 r
233	31.5	♂	29	V	26	32	58	13	4+15	3+14	—	9	9	4
234	33.6	♀	—	IV	24	34	58	14	4+15	3+15	—	9	9	?
235	34.9	♀	—	IV	25	33	58	13	4+16	3+16	—	9	9	8 r
236	32	♂	31	V	26	32	58	13	5+15	3+17	—	8	9	7 r
237	33.2	♀	—	IV	25	32	57	13	5+15	3+15	—	9	9	7 r
238	35	♂	32	V	25	31	56	12	4+15	3+16	—	8	9	ca. 7 r
239	32.2	♂	27	V	24	33	57	14	4+15	3+16	—	9	9	7 r
240	33.3	♀	—	IV	24	33	57	14	4+15	4+14	—	8	8	4 r
241	35.3	♀	—	IV	28	29	57	13	4+16	4+15	—	9	9	ca. 9 r
242	32.6	♀	—	IV	24	33	57	12	4+16	3+15	—	9	9	7 r
243	33.3	♀	—	IV	24	33	57	14	4+15	3+14	—	9	10	7 r
244	36	♂	31	V	24	34	58	13	5+15	3+15	—	9	9	8 r
245	32.1	♂	30	V	25	32	57	14	5+14	4+15	—	9	9	7 r
246	33.1	♂	24	V	26	30	56	13	4+17	3+16	—	9	9	7 r
247	37.1	♂	33	V	24	33	57	13	4+15	4+14	—	9	9	ca. 10 r
248	32	♀	—	IV	23	33	56	13	4+15	3+16	—	9	9	7 r
249	32.6	♂	27	V	25	31	56	12	4+15	3+15	17	9	9	7 r
250	32.2	♂	29	V	27	30	57	13	4+15	3+16	—	9	9	7 r
251	33.8	♀	—	IV	25	32	57	13	4+16	2+16	18	9	9	?
252	33.6	♂	26	V	26	31	57	12	4+16	3+16	—	9	9	7 r
253	31.8	♂	28	V	25	32	57	15	4+17	3+14	—	9	9	7 r
254	34.7	♀	—	IV	25	32	57	15	4+16	3+15	—	9	9	7 r
255	32.6	♀	—	IV	25	31	56	13	4+16	3+15	—	9	9	ca. 7 r
256	34.6	♀	—	III—IV	25	32	57	13	4+16	3+15	—	9	9	7 r
257	34.7	♀	—	III—IV	26	31	57	13	4+16	4+16	—	9	10	7 r
258	29.3	♀	—	IV	25	32	57	14	4+14	3+14	—	9	9	3
259	33	♂	32	V	24	32	56	14	4+15	2+16	—	9	8	?
260	32.8	♂	30	V	26	34	60	?	4+14	3+15	—	8	9	7 r
261	31.1	♀	—	III—IV	24	33	57	13	4+15	3+14	—	9	9	5 r
262	31.5	♀	—	III—IV	22	33	55	12	4+17	3+15	—	9	10	ca. 6 r
263	33.9	♂	29	V	27	30	57	14	4+15	3+14	—	8	8	6 r
264	33.5	♂	25	V	28	30	58	13	4+15	3+15	—	9	9	7 r
265	33	♂	28	V	24	34	58	13	4+16	3+15	—	9	9	7 r
266	33.2	♂	30	V	25	32	57	14	4+15	3+14	—	9	9	7 r
267	32.6	♂	26	V	24	33	57	14	5+15	3+14	—	8	9	6 r
268	35.6	♂	30	V	24	34	58	15	4+16	3+16	—	9	9	ca. 7 r
269	32.9	♂	27	V	24	34	58	14	5+15	3+16	—	10	10	6 r
270	35.9	♂	29	V	25	32	57	13	4+16	3+16	—	9	9	ca. 9 r—10 r
271	32.6	♀	—	IV	24	33	57	14	4+16	3+16	—	9	9	5 r
272	33.2	♂	25	V	23	34	57	13	5+15	3+14	—	9	8	6 r
273	31.6	♀	—	IV	26	32	58	13	4+16	3+15	—	9	9	?
274	33	♀	—	IV	24	33	57	12	4+15	3+16	—	9	9	7 r
275	34.8	♂	27	IV	24	33	57	13	4+15	3+16	—	9	9	7 r
276	34.3	♀	—	IV	27	30	57	13	4+16	2+16	—	9	9	?
277	31.2	♂	24	V	24	32	56	13	4+15	3+15	—	9	9	7 r
278	32.3	♀	—	IV	25	32	57	12	4+14	3+15	—	9	9	?
279	33.7	♀	—	IV	23	34	57	12	4+15	3+14	—	9	9	7 r
280	35.2	♂	32	V	25	33	58	13	4+16	4+15	—	9	9	7 r
281	33.5	♀	—	IV	24	34	58	13	4+15	3+15	—	9	9	7 r
282	30.5	♀	—	IV	24	33	57	13	4+16	3+16	—	9	9	6 r
283	32.3	♂	26	V	23	35	58	13	4+15	3+16	—	9	9	ca. 6 r
284	34.7	♂	29	V	24	32	56	14	4+15	3+15	—	9	9	ca. 9 r
285	32.7	♂	31	V	23	34	57	13	4+15	3+15	—	8	9	6 r
286	32.5	♀	—	IV	24	33	57	13	4+15	3+15	—	9	9	6 r
287	32.3	♂	28	V	26	31	57	14	4+15	3+15	—	9	9	6 r
288	32	♀	—	IV	25	32	57	12	4+15	3+16	—	9	8	?
289	33	♀	—	IV	23	34	57	13	4+15	3+16	—	9	9	7 r
290	34.5	♂	29	V	27	31	58	14	4+14	3+15	—	9	9	8 r

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
291	33.2	♀	—	IV	24	32	56	13	4+16	3+16	—	9	9	6 r
292	35	♂	26	V	23	34	57	14	4+16	3+16	—	10	10	ca. 9 r
293	31.5	♂	25	V	24	33	57	14	5+14	3+15	—	9	9	ca. 6 r
294	32.2	♂	28	V	25	34	59	13	4+15	4+16	—	9	9	7 r
295	31.8	♂	30	V	23	33	56	13	4+15	3+16	—	9	9	7 r
296	35.2	♂	33	V	24	33	57	14	4+15	3+15	—	9	9	ca. 7 r
297	32.5	♂	28	V	25	32	57	14	4+15	3+15	—	9	9	4

B. Herrings from Drangar at the Westmanna Isles. August 14. 1919. Maturity V—VII. Caught in drift nets.

1	30	♂	28	VI	24	34	58	13	4+16	4+15	19	9	9	5
2	32.7	♂	35	VI	23	34	57	15	5+15	3+16	18	9	9	4—5
3	33	♀	—	VI	26	32	58	13	4+15	3+16	20	9	9	7?
4	28.5	♀	—	V	25	32	57	14	4+15	3+14	19	9	9	4
5	33.5	♂	30	VI	24	33	57	13	4+15	3+15	16	9	9	7
6	31.6	♂	—	VII	28	29	57	13	4+15	3+15	18	9	9	6
7	34.2	♀	—	VI—VII	24	34	58	15	5+16	3+16	19	10	10	6
8	33	♂	32	VI	25	32	57	13	4+15	3+15	17	8	9	6
9	30	♂	28	VI	24	33	57	14	4+15	3+15	17	9	9	3
10	27.5	♂	27	VI	24	33	57	13	4+15	2+16	19	9	9	6—7
11	34.2	♂	26	VI	25	33	58	15	5+15	3+14	19	9	9	8—9
12	37	♀	—	V	23	34	57	13	4+15	3+14	18	9	9	ca. 9
13	28.9	♀	—	VI	24	33	57	14	4+15	3+15	17	9	9	3
14	34.2	♀	—	V	24	33	57	14	5+14	3+14	18	8	8	6
15	34.7	♂	34	VI	25	33	58	14	4+15	3+16	18	9	9	8—10
16	27.6	♂	12	V	24	32	56	15	4+15	3+15	18	9	9	3
17	28.8	♀	—	V	24	33	57	14	4+16	3+16	18	9	8	5
18	31.4	♂	25	VI	25	33	58	15	4+16	3+16	18	9	9	3
19	31.4	♂	29	VI	23	33	56	15	4+15	3+15	19	9	9	4
20	28.2	♀	—	VI—VII	26	33	59	13	4+15	3+15	18	9	9	3
21	29.2	♂	25	VI	25	32	57	15	4+15	3+15	16	9	9	3
22	27.7	♂	13	V	24	33	57	14	4+15	3+16	18	9	9	3
23	26	♂	25	VI	24	33	57	13	4+16	3+15	19	9	9	3
24	28.9	♂	18	VI	26	32	58	13	4+15	3+16	17	9	9	3
25	31.2	♂	—	VII	25	32	57	14	19	3+14	17	8	8	6
26	33.7	♂	41	VI	24	33	57	13	4+16	3+16	17	9	9	ca. 6
27	32.4	♂	27	VI	27	30	57	14	5+15	4+14	17	10	9	ca. 7
28	33.5	♂	—	VII	26	31	57	14	4+16	3+16	17	8	9	ca. 7
29	29.6	♂	—	VII	25	32	57	13	4+15	3+16	18	9	9	4
30	30	♂	26	VI	24	33	57	14	4+16	3+15	19	9	9	4
31	26.6	♂	18	VI	25	33	58	14	4+16	3+15	18	9	9	2
32	26.5	♂	13	V	25	32	57	14	4+15	3+14	18	9	9	3
33	34	♂	17	VI	25	31	56	14	4+15	3+14	18	9	9	5
34	26.3	♂	12	V	23	33	56	13	5+15	3+15	17	9	9	?
35	28.8	♂	28	VI	25	32	57	14	4+15	3+15	18	10	9	4
36	28.5	♂	17	VI	24	32	56	13	4+16	2+17	17	9	9	4
37	28.8	♂	19	VI	25	32	57	14	4+15	3+16	17	9	9	4?
38	33.3	♂	28	VI	25	32	57	13	4+16	3+16	18	9	9	6
39	32.3	♂	25	VI	26	31	57	14	3+16	3+14	19	9	9	ca. 7
40	28.2	♀	—	VI—VII	24	33	57	15	4+15	2+14	18	9	8	3
41	33	♂	43	VI	23	33	56	13	4+15	3+15	18	9	9	6
42	28.2	♂	27	VI	24	32	56	14	4+14	3+15	18	10	10	3
43	28.3	♂	30	VI	23	33	56	13	5+15	3+15	18	9	9	4
44	26.5	♀	—	VI—VII	25	32	57	13	5+16	3+15	18	8	8	3
45	28.9	♀	—	VI	25	31	56	14	4+16	3+14	17	9	9	4
46	27.8	♂	25	VI	26	31	57	14	4+15	3+16	17	9	9	3
47	27.4	♂	17	V	24	33	57	14	4+15	3+14	19	8	10	3

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
48	33.8	♀	—	VI	26	31	57	13	4+15	3+15	18	9	9	ca. 7
49	35	♂	36	VI	23	33	56	13	4+14	3+15	18	8	8	6
50	27.6	♂	35	VI	25	32	57	14	5+14	3+15	18	9	9	3
51	27.8	♂	25	VI	24	32	56	13	4+15	3+15	?	9	9	4
52	36	♀	—	VI	24	33	57	14	4+15	3+16	19	9	9	7
53	32.5	♂	34	VI	27	31	58	13	4+17	3+16	17	9	9	6 - 7
54	30.2	♂	—	VII	24	33	57	12	4+15	2+16	18	9	9	6
55	29.4	♂	26	VI	25	32	57	14	4+15	3+15	17	9	9	3
56	28.2	♀	—	VI	24	33	57	14	4+16	3+15	18	9	9	3
57	26.5	♂	28	VI	24	33	57	15	4+15	4+14	17	9	9	3
58	28	♂	30	VI	27	30	57	15	4+16	3+15	19	9	9	3
59	27.8	♀	—	VI	24	33	57	15	4+15	3+15	17	9	9	3
60	27.4	♂	21	VI	26	31	57	13	4+15	3+15	18	9	9	3
61	28.6	♂	32	VI	24	32	56	14	4+15	3+15	18	9	9	4
62	27.7	♀	—	VI	25	33	58	14	4+15	3+15	18	9	9	3
63	32.5	♂	35	VI	29	28	57	14	4+15	3+16	17	9	9	3
64	29	♀	—	VI	24	33	57	13	4+15	3+14	19	9	9	3
65	30.5	♂	32	VI	25	32	57	14	5+14	3+14	19	9	9	4
66	28.1	♂	30	VI	24	33	57	14	5+15	3+14	18	9	9	3
67	29.3	♂	—	VII	25	34	59	14	4+15	4+15	19	9	9	4
68	32.3	♂	27	VI	26	31	57	13	4+15	3+15	16	9	9	5—6
69	32	♂	40	VI	25	31	56	13	4+15	3+14	16	9	9	5
70	32.2	♂	30	VI	26	31	57	14	4+15	4+15	18	9	9	6
71	33.3	♀	—	VI	24	34	58	15	4+16	3+15	18	9	9	6
72	34.5	♀	—	VI	25	32	57	14	4+15	3+15	18	9	9	ca. 6
73	29.3	♀	—	VI	24	33	57	13	5+15	3+16	18	9	9	3—4
74	26	♂	23	VI	23	34	57	15	4+15	3+15	18	9	9	3
75	32.8	♂	26	VI	25	33	58	13	4+15	3+15	19	9	9	5
76	35.2	♂	32	VI	25	31	56	13	4+15	4+15	19	9	10	?
77	34.0	♀	—	—	24	33	57	14	4+15	3+16	17	8	8	4
78	30.4	♂	28	VI	24	34	58	13	4+15	3+15	18	9	9	3
79	28.6	♀	—	—	24	34	58	14	4+15	4+14	18	9	9	3
80	33.3	♂	30	VI	24	32	56	13	4+15	3+14	17	9	9	6
81	33.5	♂	31	VI	25	32	57	13	4+15	3+16	16	8	9	6
82	33.6	♂	33	VI	25	32	57	14	4+15	3+15	17	9	9	?
83	27.1	♂	21	VI	26	31	57	14	4+16	3+15	18	9	9	3
84	28.3	♀	—	VI—VII	23	34	57	14	4+15	3+16	17	9	9	3
85	26.4	♀	—	VI	24	33	57	14	4+15	3+16	17	8	9	3
86	32.7	♂	26	VI	25	32	57	14	5+15	3+15	19	9	9	5
87	34.1	♀	—	VI—VII	26	31	57	14	4+15	3+14	18	9	9	7
88	33.2	♂	25	VI	24	32	56	13	4+15	3+14	17	8	9	6
89	35.8	♂	32	VI	24	34	58	15	4+16	3+15	19	9	9	ca. 10
90	33.2	♂	28	VI	26	31	57	14	4+15	3+14	16	8	9	ca. 7
91	33.5	♀	—	VI	24	32	56	13	4+15	3+15	17	9	9	6
92	37	♀	—	VI	25	32	57	13	4+15	4+14	18	9	9	?
93	28.8	♂	30	VI	24	33	57	14	4+14	3+15	17	9	9	4
94	33.2	♂	35	VI	25	32	57	14	4+14	3+13	17	8	8	7—8
95	26.4	♂	24	VI	24	33	57	13	4+15	3+16	18	9	9	3
96	31.7	♂	16	V	23	34	57	14	4+15	4+14	18	9	9	6
97	32	♂	32	VI	25	32	57	14	4+15	3+15	18	8	9	7
98	27	♂	27	VI	24	33	57	13	5+14	3+15	19	10	10	4
99	28.7	♂	20	VI	24	33	57	14	4+16	3+15	17	9	8	6
100	33.5	♂	32	VI	23	34	57	14	4+16	3+15	20	9	9	ca. 6
101	32.2	♂	27	VI	24	33	57	12	4+15	2+14	17	9	9	6
102	27.1	♂	18	VI	25	32	57	14	5+15	4+14	17	9	9	3
103	30.8	♂	32	VI	24	32	56	15	4+16	3+13	18	9	9	4
104	27.8	♂	20	VI	25	32	57	13	4+16	3+17	17	9	9	3—4
105	34.2	♀	—	VI—VII	26	32	58	13	4+16	3+15	17	9	9	ca. 6
106	33	♂	32	VI	26	31	57	13	5+15	3+17	18	9	9	6

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
107	28.7	♀	—	VI	23	34	57	14	4+15	3+15	19	9	9	4
108	36.2	♂	45	VI	24	32	56	14	4+16	3+15	17	9	9	ca. 10
109	29.3	♂	30	VI	25	32	57	13	4+15	3+15	18	9	9	4
110	27	♀	—	VI	24	32	56	14	4+15	3+15	17	9	9	3
111	25.2	♂	21	VI	24	33	57	12	4+16	3+16	18	9	9	3
112	33.8	♂	36	VI	26	31	57	14	5+15	3+17	19	9	9	6
113	36.2	♀	—	VI	24	34	58	13	5+15	3+16	18	9	9	ca. 9
114	28.8	♂	24	VI	24	32	56	13	4+15	3+15	17	9	9	3
115	32.3	♂	24	VI	25	32	57	15	4+15	3+13	18	9		5
116	32.8	♀	—	VI	24	33	57	14	4+15	3+13	18	8	9	6—7
117	32.4	♀	—	V	25	31	56	13	4+16	3+15	18	9	9	6
118	28.2	♂	26	VI	25	33	58	14	4+15	4+15	17	10	9	3
119	28.2	♀	—	VI	24	33	57	13	4+16	3+15	?	9	9	3
120	32	♂	14	V	25	33	58	13	5+15	4+15	17	9	9	5
121	28.1	♂	25	VI	25	31	56	14	4+15	3+15	17	8	8	?
122	27.6	♂	29	VI	25	31	56	15	5+15	3+15	17	9	9	3
123	27.3	♂	23	VI	25	33	58	12	4+15	3+15	18	9	9	3
124	33	♂	24	VI	25	33	58	14	4+16	3+16	17	9	9	5
125	27.6	♂	—	V	24	33	57	14	4+15	3+16	18	9	9	3
126	36.1	♂	31	VI	24	33	57	14	4+15	3+14	19	9	9	ca. 10
127	28.8	♂	29	VI	24	33	57	15	5+15	3+16	?	9	9	3
128	32.2	♂	28	VI	26	31	57	13	4+15	3+15	16	8	8	6
129	34	♀	—	VI	24	34	58	14	4+16	3+15	19	9	9	7
130	28.8	♂	31	VI	26	31	57	14	4+15	4+15	17	9	9	3
131	29.1	♂	18	V	25	32	57	13	4+15	4+15	19	10	10	4
132	34.4	♂	22	VI	25	32	57	14	4+16	3+15	18	9	9	?
133	34.3	♂	34	VI	25	32	57	13	4+15	2+16	19	9	9	7
134	30.6	♂	28	VI	25	32	57	14	4+17	3+16	18	9	9	3
135	29.6	♀	—	VI	24	32	56	13	4+15	3+15	19	9	9	4
136	32.3	♂	14	V	24	33	57	14	5+15	3+15	?	9	9	6—7
137	29.5	♂	27	VI	24	33	57	14	4+15	3+16	19	9	9	ca. 4
138	29	♂	30	VI	25	32	57	14	4+15	3+15	18	9	9	4—5
139	29.2	♂	32	VI	24	33	57	14	4+16	3+15	17	9	9	4
140	29.9	♂	13	V	24	34	58	13	4+16	3+15	18	9	9	6
141	32.8	♂	26	VI	25	32	57	14	4+15	3+15	17	8	8	ca. 6
142	32.5	♂	25	VI	26	30	56	13	4+14	3+15	17	9	9	7
143	32.3	♂	33	VI	26	31	57	13	4+16	3+15	17	9	9	ca. 6
144	28.1	♂	15	V	25	32	57	14	4+15	3+16	18	9	9	3
145	32	♂	33	VI	25	33	58	14	4+17	3+16	18	9	9	4
146	26.9	♂	20	VI	25	32	57	13	4+16	3+15	18	9	9	3
147	28.9	♀	—	VI	25	33	58	13	4+15	4+15	19	8	8	3
148	28.7	♂	14	V	24	32	56	15	4+15	3+15	18	9	9	3
149	31.2	♂	30	VI	26	31	57	13	5+15	3+16	17	9	9	6
150	33.2	♂	32	VI	24	33	57	14	4+16	3+15	17	9	9	6
151	27.7	♂	24	VI	25	32	57	13	4+15	3+16	?	9	9	3
152	28.2	♂	15	V	24	32	56	14	4+15	3+15	19	9	9	4
153	25.8	♂	21	VI	24	33	57	15	4+16	3+15	18	9	9	3
154	31.7	♂	27	VI	24	30	54	13	5+15	3+15	18	9	9	6
155	29.4	♂	19	VI	25	32	57	13	4+15	3+16	18	8	9	4
156	34.5	♂	25	VI	25	32	57	14	4+15	3+14	16	9	9	ca. 8
157	27.7	♂	20	VI	24	33	57	14	4+15	3+15	18	9	9	3
158	29.4	♀	—	VI	23	34	57	13	5+15	4+14	17	8	9	3
159	27.1	♂	21	VI	26	31	57	14	4+15	3+16	16	9	9	3
160	33.4	♀	—	VI	27	31	58	14	4+15	4+15	18	8	9	6
161	26.5	♂	21	VI	24	33	57	14	4+15	2+17	18	10	9	3
162	32.6	♂	24	VI	22	35	57	13	4+15	4+16	18	9	9	6
163	26.1	♂	27	VI	25	32	57	13	4+15	3+16	19	9	9	3
164	33.4	♀	—	VI	25	32	57	13	4+16	3+15	18	8	9	ca. 7
165	32.7	♀	—	VI	26	31	57	14	4+15	3+15	18	9	9	8—9

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in right pectoral	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total					right	left	
166	32	♂	21	VI	24	33	57	14	4+15	3+15	18	9	9	4
167	31.3	♀	—	VI	24	33	57	14	4+15	3+13	18	8	9	5
168	26.3	♂	20	VI	25	32	57	13	4+16	3+15	18	10	9	3
169	28.8	♀	—	VI	25	32	57	13	4+15	3+14	18	9	9	3
170	29.6	♂	27	VI	24	33	57	14	4+14	3+15	19	9	9	4
171	28.4	♂	25	VI	24	33	57	14	4+15	3+15	18	9	9	4
172	27.5	♀	—	VI	25	33	58	13	4+16	3+16	17	9	9	4
173	29.1	♂	19	VI	24	33	57	14	4+14	3+15	18	9	9	4—5
174	28.8	♂	22	VI	25	32	57	14	5+15	3+16	18	9	9	4
175	27.9	♂	25	VI	25	32	57	14	4+15	3+15	17	9	9	3
176	32.7	♂	20	V	26	31	57	14	4+17	3+15	17	9	9	6
177	33 6	♂	32	VI	25	32	57	13	4+16	3+15	17	9	9	6
178	31.5	♂	28	VI	25	33	58	14	4+15	3+17	19	9	9	4
179	29.7	♂	24	VI	25	32	57	13	4+16	3+16	20	9	10	3
180	28.7	♂	25	VI	24	34	58	13	4+16	2+16	17	9	9	4

C. Herrings from Kongshavn, the Faroes. August 16. 1919. Maturity I—II.

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total				right	left	
1	25.4	♀	2	I	24	34	58	14	4+15	3+16	8	8	2
2	26.8	♂	5	I—II	25	32	57	13	4+15	3+15	9	9	3
3	27.1	♂	3	I	25	33	58	14	5+16	3+15	9	9	2
4	25.4	♂	3	I	25	32	57	14	5+16	3+15	9	9	3
5	27.1	♀	4	I—II	25	33	58	14	4+15	3+16	9	9	3
6	25	♀	4	I	24	32	56	13	4+15	3+14	9	9	3
7	21.2	♀	2	I	25	32	57	13	4+15	3+16	9	9	1
8	26.2	♀	4	I	24	32	56	13	4+15	3+16	8	8	?
9	25.8	♀	4	I	23	34	57	14	4+14	3+15	9	9	2
10	25.7	♂	3	I	24	33	57	13	5+14	3+15	9	8	2
11	27.1	♀	5	I—II	24	32	56	13	4+16	3+15	8	9	2
12	21.7	♂	2	I	25	32	57	14	5+15	3+16	9	9	1
13	26.5	♀	4	I	26	31	57	15	5+15	3+16	9	9	2
14	26.6	♂	3	I	24	33	57	14	4+15	3+16	9	9	2
15	20.3	♂	2	I	25	31	56	14	5+15	3+14	9	9	1
16	21.4	♂	2	I	26	31	57	14	4+16	3+16	9	9	1
17	27.2	♀	4	I	23	33	56	14	4+15	3+15	9	9	2
18	26.8	♂	3	I	25	32	57	15	4+15	3+16	9	9	2
19	26.2	♀	4	I	24	33	57	14	4+15	3+16	8	9	2
20	25.1	♂	4	I	23	33	56	14	4+16	3+16	9	9	2
21	26.2	♂	3	I	25	31	56	14	5+15	3+16	9	9	2
22	25.2	♂	3	I	25	32	57	13	4+15	3+16	9	9	2
23	26	♀	5	I—II	26	31	57	13	4+15	3+15	9	9	2
24	25.5	♀	3	I	23	33	56	13	5+14	3+14	8	8	2
25	26.5	♂	3	I	24	33	57	13	4+15	3+15	9	9	2
26	22.3	♀	3	I	24	33	57	14	5+15	3+14	9	9	2
27	21.5	♂	2	I	24	33	57	14	4+15	3+15	9	9	1
28	21.5	♀	2	I	25	33	58	14	4+15	3+16	9	9	1
29	26	♂	3	I	23	34	57	14	4+15	3+15	9	9	2
30	27.5	♀	5	I—II	24	30	54	14	4+15	3+15	9	9	2
31	27.1	♀	5	I	25	32	57	15	4+15	3+16	9	9	2
32	26.3	♂	3	I	25	33	58	13	4+15	3+15	9	9	2—3
33	23.1	♂	2	I	24	33	57	13	5+14	3+14	9	9	1
34	25.1	♀	4	I	24	33	57	13	4+16	2+16	9	9	3
35	22.2	♀	2	I	24	33	57	14	4+15	3+15	9	9	2

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total				right	left	
36	21.1	♀	2	I	23	33	56	16	4+15	3+15	9	9	(?)
37	26.1	♂	3	I	25	33	58	14	4+15	3+16	9	9	2
38	26.7	♂	3	I	26	32	58	13	4+16	3+16	9	9	3
39	21.9	♂	2	I	24	34	58	15	4+16	3+16	9	9	1
40	21 6	♂	2	I	24	33	57	12	4+15	3+14	9	9	1
41	21.8	♂	2	I	23	33	56	14	5+15	2+14	9	9	1
42	25.5	♀	3	I	24	32	56	14	4+15	3+17	9	9	2
43	26.2	♀	4	I	25	32	57	14	4+16	3+15	9	9	2
44	25.9	♀	4	I	25	32	57	15	4+15	3+14	9	9	2
45	25.8	♀	4	I	25	32	57	13	5+15	3+16	9	9	2
46	21.6	♂	3	I	25	32	57	14	4+15	3+15	9	9	1
47	22	♀	3	I	24	33	57	14	5+15	3+16	9	9	2
48	22	♀	2	I	24	32	56	14	5+15	3+15	9	9	1
49	27.1	♂	3	I	23	34	57	13	5+14	3+15	9	9	2
50	26	♀	4	I—II	24	33	57	15	5+14	3+14	9	9	3
51	27.3	♂	4	I	24	33	57	14	4+16	2+16	9	9	2
52	21.5	♂	2	I	26	30	56	13	5+14	3+14	9	9	2
53	30.4	♀	—	VII	24	32	56	14	4+16	3+16	9	9	(5)
54	27.3	♀	5	I–II	25	32	57	14	4+15	3+16	9	9	3
55	25.3	♂	4	I	24	33	57	14	4+15	3+14	9	9	2
56	22.2	♂	3	I	25	31	56	12	4+15	2+15	9	9	2—3
57	26.6	♂	4	I	25	32	57	14	4+15	3+16	9	9	2
58	25.2	♂	3	I	24	34	58	14	5+14	3+15	9	9	(?)
59	22.2	♂	2	I	24	33	57	13	4+15	2+15	9	9	1
60	22.4	♂	3	I	23	34	57	14	4+16	3+14	9	9	1
61	27.4	♂	3	I	24	33	57	13	4+15	3+16	9	9	3
62	25 9	♂	3	I	25	32	57	14	4+15	3+14	9	9	2—3
63	26.2	♂	3	I	24	32	56	15	4+15	3+15	9	9	(?)
64	20.8	♀	2	I	26	31	57	14	5+15	3+16	9	9	1
65	25	♀	4	I	25	33	58	15	4+15	3+14	9	9	(?)
66	21.7	♂	2	I	24	34	58	13	4+16	3+15	9	9	1
67	27.2	♂	3	I	25	32	57	13	4+15	3+16	9	9	3
68	25.9	♂	4	I	24	32	56	14	4+16	3+15	9	9	2
69	27.3	♀	5	I—II	25	32	57	14	4+15	3+15	9	9	2
70	22.1	♀	3	I	24	33	57	16	4+15	2+15	9	9	2
71	22.1	♂	2	I	22	31	53	14	5+15	2+15	9	9	(?)
72	26.5	♂	4	I	25	32	57	13	4+15	3+16	8	8	2
73	21.5	♂	2	I	24	33	57	13	4+15	3+15	9	9	1
74	26.5	♀	5	I—II	25	32	57	14	4+16	3+16	9	9	2
75	26	♂	5	II	25	32	57	13	5+14	3+15	8	9	3
76	21.3	♀	2	I	25	32	57	14	4+15	3+14	9	9	1
77	25.6	♂	3	I	25	32	57	14	5+15	3+15	9	9	2
78	21.3	♀	2	I	24	33	57	12	4+15	3+15	9	9	2
79	23	♂	2	I	24	34	58	14	4+15	3+15	9	9	(1 ?)
80	25.4	♂	3	I	24	33	57	14	4+16	3+14	9	9	2
81	26.3	♂	3	I	24	34	58	14	4+14	3+15	9	8	2
82	22	♂	2	I	24	32	56	15	4+16	3+16	9	9	1
83	27.6	♂	4	I	24	33	57	15	4+16	3+16	9	9	3
84	25.8	♂	3	I	26	32	58	14	4+16	3+14	9	9	(?)
85	26.1	♂	4	I	24	33	57	14	5+15	3+15	9	9	2
86	21.6	♂	3	I	24	33	57	16	4+16	3+15	9	9	1
87	26.6	♂	3	I	23	34	57	13	5+16	3+17	9	9	3
88	21.7	♀	2	I	25	32	57	13	5+14	3+15	9	9	2
89	22.4	♀	3	I	25	31	56	14	4+15	3+15	9	9	2
90	28	♀	6	I—II	25	33	58	14	5+14	3+15	9	9	4
91	20.7	♀	3	I	22	35	57	14	5+15	3+15	8	8	1
92	27.4	♂	5	II	23	33	56	14	4+15	3+15	9	9	3
93	28.4	♂	4	III	24	34	58	13	5+15	3+14	9	9	3
94	26.5	♂	6	II	24	33	57	14	5+14	3+15	9	9	3

No.	Length cm	Sex	Breadth of Gonade mm	Maturity	Vertebrae			Keeled Scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
					Precaudal	Caudal	Total				right	left	
95	27.8	♀	6	I—II	23	34	57	14	4+15	3+15	8	8	2—3
96	27.5	♀	5	I—II	23	34	57	14	5+15	3+16	9	9	4
97	27.1	♀	6	II	25	30	55	14	4+16	3+15	9	9	2
98	22	♂	2	I	24	33	57	15	4+15	3+14	9	9	?
99	26.4	♂	4	I	23	34	57	15	4+15	3+15	9	8	2—3
100	27.1	♀	4	I—II	25	32	57	14	4+16	3+15	9	9	2
101	21.6	♀	2	I	25	31	56	15	4+15	3+15	9	9	?
102	26.6	♂	4	I	24	34	58	14	4+16	3+15	9	8	2
103	21.6	♀	2	I	26	32	58	15	4+16	3+15	9	9	1—2
104	25.3	♀	5	I—II	26	31	57	13	4+15	3+16	9	9	2
105	21.2	♀	2	I	24	33	57	12	4+15	3+16	9	9	2
106	26.2	♀	4	I—II	25	33	58	14	4+16	3+16	9	9	3
107	27.5	♀	5	I—II	24	34	58	12	4+16	3+16	9	9	2
108	27.1	♂	5	I—II	25	32	57	14	4+15	3+16	9	9	2
109	26	♀	4	I—II	25	32	57	15	4+15	3+15	8	8	2
110	26	♂	3	I	24	33	57	14	4+15	3+16	9	9	3
111	21.8	♀	2	I	24	33	57	15	5+15	3+15	9	9	1
112	24.2	♂	3	I	24	32	56	13	4+15	3+15	9	9	2
113	22	♂	2	I	25	32	57	13	5+15	3+14	9	9	1
114	21.9	♂	2	I	24	33	57	14	4+16	3+14	9	9	1
115	27.4	♂	4	I—II	24	33	57	13	5+14	3+14	9	9	2
116	26.9	♀	4	I—II	25	31	56	14	5+14	3+15	9	9	3
117	26.6	♀	3	I	25	32	57	14	4+16	3+15	9	9	3
118	25.5	♂	3	I	25	31	56	13	4+15	3+15	9	8	2
119	27.2	♀	5	I—II	25	33	58	13	4+15	3+15	9	9	3
120	26.3	♀	4	I—II	25	32	57	13	5+15	3+15	9	9	3
121	25.2	♀	4	I—II	24	32	56	15	4+15	3+14	9	9	2
122	27.0	♂	4	I	25	33	58	13	5+14	—	9	9	2
123	21.6	♀	2	I	24	33	57	14	4+16	3+15	9	9	1—2
124	20.9	♂	3	I	24	33	57	13	4+15	3+16	9	9	1

ENGLISH RESUMÉ.

1. The summer-spawning Icelandic herring is a very large sea herring, which attains a similar size as the Atlanto-Scandian spring herring. At the age of 7 years it has an average length of ca. 33 cm, and at the age of 10 years an average length of ca. 36 cm. It reaches maturity as a rule at the age of 4—6 years and has at this lime a length of 25—30 cm.
2. The conception »race« in Heinckes meaning of the word must be modified since it appears that real differences in the individually constant characters may occur between various age groups of specimens spawning on the same spot and at the same time.

   It is probable that such real differences occur for all the characters investigated, but some characters are obviously more constant than others. In the material at hand from Eldey Bank and Drangar the following characters have been the most constant:

Total number of vertebrae.
Total number of anal fin rays.
Number of unbranched anal fin rays.
Number of branched anal fin rays.

The greatest difference between the various age groups has for these characters been smaller than the standard deviation of the difference taken $1^1/_2$ times.

The following characters have been the most variable.
Number of keeled scales (K_3).
Number of ventral fin rays.
Number of pectoral fin rays.

The greatest difference between the various age groups has for these characters been more than 3 times as great as the standard deviation of the difference, and it has had a numerical value from 0.27 to 0.57.

For the characters below the highest difference observed between the age groups has been 1.5—3 times as high as the standard deviation of the difference:

Number of precaudal vertebrae
Number of caudal vertebrae
Total number of dorsal fin rays
Number of unbranched dorsal fin rays
Number of branched dorsal fin rays.

3. The differences found between various age groups of specimens spawning on the same spot and at the same time are not so great that they make the conception »race« illusory in the case of the herring. But extensive investigations are needed in order to procure information about the magnitude of the differences of this kind in many different localities at various times.
4. The summer-spawning Icelandic herring differs from the Atlanto-Scandian spring herring:
   By a lower average number of vertebrae (vert. S.)
   » » » » » » » caudal vertebrae
   » » relatively higher average number of precaudal vertebrae
   As a rule by a lower number of keeled scales (K_3).
   » » » » » » » » dorsal fin rays.
5. The Icelandic summer herring occurs in abundance at the southwest coasts of Iceland and is there the object of an important fishery (Fig. 4 p. 22). It is not known yet whether it undertakes extensive migrations after the spawning to the waters north and east of Iceland.
6. A summer-spawning herring, which is still very little known, occurs at the Faroes. There is reason to suppose that we have had this herring before us in a sample of young herrings captured at Kongshavn in August 1919. This young herring resembles very much the Icelandic summer herring, but it can however be distinguished by a somewhat lower number of precaudal vertebrae and unbranched anal fin rays, and a somewhat higher number of unbranched dorsal fin rays.
7. The Icelandic summer herring has a higher number of precaudal vertebrae and a lower number of keeled scales (K_3) than all the other summer- or autumn-spawning sea herrings, with a more southernly or easternly distribution, which have been previously examined.

DANSK RESUMÉ.

1. Den sommergydende islandske Sild er en meget stor Havsild, der opnaar en lignende Størrelse som den atlanto-skandiske Foraarssild. I 7-Aars Alderen har den en Gennemsnitslængde af ca. 33 cm og i 10 Aars Alderen en Gennemsnitslængde af ca. 36 cm. Den opnaar i Reglen Kønsmodenheden i 4—6 Aars Alderen og har da en Længde af ca. 25—30 cm.
2. Begrebet »Race« i Heinckes Betydning af Ordet maa undergaa en Modification. Det viser sig nemlig, at der kan optræde virkelige Forskelligheder i de individuelt konstante Karakterer mellem forskellige Aargange af Individer, der yngler paa samme Sted og paa samme Tid. Det er sandsynligt, at saadanne Forskelligheder forekomme for alle de undersøgte Karakterer, men nogle Karakterer er tydeligvis mere konstante end andre. I det undersøgte Materiale af sommergydende Sild fra Eldey Bank og Drangar har følgende Karakterer været mest konstante:

   Totalantal af Hvirvler,
   Totalantal af Analfinnestraaler,
   Antal af ugrenede Analfinnestraaler,
   Antal af grenede Analfinnestraaler.

   Den højeste Differens mellem de forskellige Aldersklasser har for disse Karakterer været mindre end $1^1/_2$ Gang Middelfejlen paa Differensen.

   De mest variable Karakterer har været følgende:

   Antal af Kølskæl (K_2),
   Antal af Bugfinnestraaler,
   Antal af Brystfinnestraaler.

   Den højeste Differens mellem de forskellige Aldersklasser har for disse Karakterer været mere end 3 Gange saa stor som Middelfejlen paa Differensen og har haft en numerisk Værdi mellem 0.27 og 0.57.

   For følgende Karakterer har den højeste fundne Differens mellem de forskellige Aldersklasser været mellem 1.5 og 3 Gange saa høj som Middelfejlen paa Differensen:

   Antal af præcaudale Hvirvler,
   Antal af caudale Hvirvler,
   Totalantal af Dorsalfinnestraaler,
   Antal af ugrenede Dorsalfinnestraaler,
   Antal af grenede Dorsalfinnestraaler.
3. De fundne Forskelligheder mellem de forskellige Aargange af Individer ynglende paa samme Sted og paa samme Tid er ikke saa store, at de gør Racebegrebet illusorisk for Sildens Vedkommende. Men der kræves fortsatte indgaaende Undersøgelser for at skaffe Oplysning om, hvor store Forskelligheder af denne Art kan være paa mange forskellige Steder og til forskellige Tider.
4. Den sommergydende islandske Sild adskiller sig fra den atlanto-skandiske Foraarssild
   1. ved et lavere Gennemsnitstal af Hvirvler (Vert. S.),
   2. — — — - caudale Hvirvler,
   3. ved et relativt højere Gennemsnitstal af præcaudale Hvirvler,
   4. i Reglen ved et lavere Antal af Kølskæl (K_2),
   5. i Reglen ved et lavere Antal af Dorsalfinnestraaler.

5. Den islandske Sommersild optræder i stor Mængde ved Islands sydvestlige og vestlige Kyster og er her Genstand for et vigtigt Fiskeri. Om den ligesom Foraarssilden efter Gydningen foretager omfattende Vandringer til Farvandene Nord og Øst for Island, er endnu ikke oplyst.
6. Der optræder ved Færøerne en sommergydende Sild, der endnu kun er lidet kendt. Der er Grund til at antage, at jeg har haft denne Sild for mig i en Prøve af Ungsild fanget ved Kongshavn i August 1919. Denne Ungsild slutter sig nær til den islandske Sommersild, men den kan dog adskilles fra denne ved et lidt lavere Antal af præcaudale Hvirvler og af ugrenede Analfinnestraaler og et lidt højere Antal af ugrenede Dorsalfinnestraaler.
7. Den islandske Sommersild har et større Antal præcaudale Hvirvler og et ringere Antal af Kølskæl (K_2) end alle andre hidtil kendte sommer- og efteraarsgydende Havsild med sydligere eller østligere Udbredelse.

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THE ATLANTO-SCANDIAN SPRING HERRING SPAWNING AT THE FAROES

BY

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In a paper »On the large spring-spawning Sea-Herring (Clupea harengus L.) in the North-West European Waters«[1]) I have described a sample of herrings consisting of 207 young herrings and 9 mature specimens captured at Kongshavn on the Faroes on September 10th 1915. I have there shown that the young herring belong to the same race or race group of herrings as the Icelandic spring spawning herring and the large Norwegian spring herring, but as the herrings were not mature when examined I was not able to say whether this race group of herring which I call »The Atlanto-Scandian Spring Herring« does spawn at the Färoes.

Through the kindness of Dr. Johs. Schmidt I have however received a sample of mature herrings captured at Kongshavn in the beginning of April 1920 and these herrings also appeared to belong to the Atlanto-Scandian spring herring.

The sample in question consisted of 160 specimens of a length of 29—35 cm, and the specimens were mature, as a rule of maturity V—VI. A few specimens were blood-herrings (maturity VII) having just completed the spawning. It is therefore beyond doubt, that we are concerned here with a herring spawning at the Faroes. The distribution of the specimens according to length and sex was as follows:

Length cm	♂	♀	?	Total
29	2	1	—	3
30	11	7	—	18
31	15	17	—	32
32	25	23	—	48
33	13	17	1	31
34	4	15	—	19
35	3	6	—	9
Number	73	86	1	160

The distribution of the specimens according to length and number of winter rings was as follows:

Kongshavn. April 1920.

Length in cm . . .		29	30	31	32	33	34	35	Total	Average length	+ 0.5
Age group	No. of winter rings										
1917	3	1	8	3	3	—	—	—	15	30.5	31.0
1916	4	1	4	1	1	—	—	—	7	30.3	30.8
1915	5	—	2	8	4	—	—	—	14	31.1	31.6
1914	6	—	3	8	6	4	1	1	23	31.8	32.3
1913	7	1	1	7	23	10	7	1	50	32.3	32.8
1912	8	—	—	3	7	10	6	2	28	32.9	33.4
1911	9	—	—	—	3	5	4	2	14	33.3	33.8
1909	11	—	—	—	—	—	—	1	1	35.0	35.5
—	5—6	—	—	—	1	—	—	—	1	32.0	32.5
—	8—9	—	—	—	—	2	—	—	2	33.0	33.5
—	?	—	—	2	—	—	1	2	5	33.2	33.7
		3	18	32	48	31	19	9	160		

[1]) Meddelelser fra Kommissionen for Havundersøgelser. Ser. Fiskeri Bd. V. Nr. 8. København 1919.

It will be seen that the average length of specimens of ca. 9—11 years age was ca. 34 cm or about the same as in the case of the Atlanto-Scandian spring herring spawning at Norway and Iceland (JOHANSEN l. c. 1919).

The numerical values found for the various characters were as follows:

Vertebrae.

Vert. S. No.	Vert. S. Freq.	Prec. Vert. No.	Prec. Vert. Freq.	Caud. Vert. No.	Caud. Vert. Freq.
55	2	22	1	29	1
56	9	23	23	30	2
57	84	24	74	31	4
58	65	25	46	32	35
		26	13	33	77
		27	2	34	34
		28	1	35	7
n	160		160		160
m	57.33		24.36		32.97
σ	0.64		0.91		0.961
σ_m	0.051		0.072		0.076
σ_σ	0.036		0.051		0.054

Anal fin rays.

Total No.	Total Freq.	Unbranched rays No.	Unbranched rays Freq.	Branched rays No.	Branched rays Freq.
16	1	2	1	13	1
17	31	3	147	14	37
18	87	4	12	15	83
19	32			16	33
20	9			17	6
n	160		160		160
m	18.11		3.07		15.04
σ	0.80		0 271		0.784
σ_m	0.063		0.022		0.062
σ_σ	0.045		0.016		0.044

Dorsal fin rays.

Total No.	Total Freq.	Unbranched rays No.	Unbranched rays Freq.	Branched rays No.	Branched rays Freq.
18	17	3	1	13	1
19	93	4	142	14	19
20	47	5	16	15	99
21	3			16	39
				17	1
n	160		159		159
m	19.23		4.09		15.13
σ	0.65		0.314		0.634
σ_m	0.052		0.025		0.050
σ_σ	0.037		0.018		0.036

Keeled scales (K_2) No.	Keeled scales (K_2) Freq.	Ventr. fin rays No.	Ventr. fin rays Freq.
12	8	16	5
13	55	17	9
14	62	18	143
15	33	19	2
		20	1
n	158		160
m	13.76		17.91
σ	0.84		0.46
σ_m	0.067		0.036
σ_σ	0.047		0.026

A comparison between the herring described here, and samples of the Atlanto-Scandian spring herring from Norway and Iceland will shew that they belong to the same race or race group. We shall compare for example the Faroe spring herring with the sample of the Icelandic spring herring from the Eyjafiord district, (JOHANSEN l. c. 1919) the samples of »large herrings« and »fat herrings« from the Nordland district (after BROCH) and the samples described by HEINCKE and BROCH of Norwegian spring herring of maturity IV—VI, captured between Haugesund and Aalesund (JOHANSEN l. c. 1919, pp 16 and 19).

Herring. — Kongshavn April 1920 minus Eyjafiord Sept. 1915.

Diff.	Vert. S.	— 0.03	st. dev. of diff.	0.072
—	prec. Vert.	— 0.05	—	0.094
—	caudal Vert.	+ 0.01	—	0.102
—	keeled scales (K_2)	— 0.08	—	0.085
—	ventral fin rays	— 0.02	—	0.054

Herring. — Kongshavn April 1920 minus Nordland-District (Hj. Broch).

Diff.	Vert. S.	— 0.03	st. dev. of diff.	0.071
—	prec. Vert.	— 0.19	—	0.098
—	keeled scales (K_2)	— 0.15	—	0.090
—	ventral fin rays	— 0.01	—	0.073

Herring. — Kongshavn April 1920 minus Norwegian spring herring, Haugesund-Aalesund.

Diff. Vert. S.	— 0.23	st. dev. of diff.	0.061
— prec. Vert.	— 0.28	—	0.119
— keeled scales (K_2)	— 0.30	—	0.079
— ventral fin rays	+ 0.04	—	0.051

The survey shews, that no real difference has been found to exist between the Faroe spring herring and the Icelandic large herring from the Eyjafiord district and the Norwegian fat herring and large herring from the Nordland district, whilst there is a slight difference between the sample of Faroe spring herring and the samples of Norwegian spring herring captured between Haugesund and Aalesund. We cannot judge at present whether this slight difference is of any real importance. A similar difference has been found between the above mentioned samples of fat herrings and large herrings from the Nordland district and the spring herring from the stretch Aalesund-Haugesund (Johansen l. c. 1919). According to Lea's investigations, the herring at the northern coasts of Norway have not always such a low number of vertebrae as that found by Broch in the Nordland district. Lea has, for instance, observed an average number of vertebrae of 57.72[1]) in 241 herrings (with two winter-rings) captured at the northern coasts of Norway in the autumn of 1915, and the standard deviation of this average may be estimated to ca. 0.04. (In a younger age group with one winter-ring the average figure was only 57.37). As I have shown, we can, in different age groups of mature herrings of the same race, find a real difference with regard to several of the individually constant characters of the same magnitude as that which has been observed between the spring herring from the Faroes and the Norwegian spring herring from the south-west coasts of Norway[2]).

The material at hand is, on the whole, too small to form the basis of an investigation in order to determine whether the different age groups differ decidedly from each other in the characters investigated. Small deviations occur probably here. Thus the age groups 1915, 1916 and 1917 put together appear to have a lower number of vertebrae as well as a lower number of keeled scales than the age groups 1909 to 1914 taken together. The number of vertebrae for the two groups is as follows:

No.	Age groups 1915—17 Freq.	Age groups 1909—14 Freq.
55	—	2
56	5	4
57	20	57
58	10	52
n	35	115
m	57.143	57.383
σ	0.648	0.643
σ_m	0.110	0.060
σ_σ	0.077	0.042

The difference is 0.24 with a standard deviation of 0.125. If we calculate the correlation between the number of winter-rings and the number of vertebrae, and between the length in cm and the number of vertebrae, we obtain the following result:

[1]) Einar Lea: Age and Growth of the Herring in Canadian Waters. Canadian Fisheries Expedition 1914—15 under the direction of Dr. Johan Hjort. Ottawa 1919.

[2]) A. C. Johansen: On the summer-spawning Herring of Iceland. Meddelelser fra Kommissionen for Havundersøgelser. Ser. Fiskeri. Bd. 6. Nr. 3 1921.

	No. of vertebrae				Total
	55	56	57	58	
No. of winter-rings					
3	—	1	11	3	15
4	—	—	4	3	7
5	—	4	6	4	14
6	—	1	12	10	23
7	2	3	21	24	50
8	—	—	18	10	28
9	—	—	6	8	14
11	—	—	1	—	1
	2	9	79	62	152

$r = 0.137$; $\sigma_r = 0.0798$; $\frac{r}{\sigma_r} = 1.72$.

	No. of vertebrae				Total
	55	56	57	58	
Length cm					
29	1	—	2	—	3
30	—	3	12	3	18
31	—	1	23	8	32
32	1	5	18	24	48
33	—	—	15	16	31
34	—	—	10	9	19
35	—	—	4	5	9
	2	9	84	65	160

$r = 0.289$; $\sigma_r = 0.0727$; $\frac{r}{\sigma_r} = 3.98$.

The correlation between the length and the number of vertebrae is an expression for the same phenomenon as the correlation between number of winter-rings and number of vertebrae.

The number of keeled scales (K_2) is as follows for the groups treated above:

	Age groups 1915—17	Age groups 1909—14
No.	Freq.	Freq.
12	2	5
13	17	37
14	10	49
15	6	24
n	35	115
m	13.571	13.800
σ	0.850	0.819
σ_m	0.144	0.076
σ_σ	0.102	0.054

The difference is 0.29, and st. dev. of the diff. 0.16.

A calculation of the correlation between the number of winter-rings and keeled scales gives the following result:

	No. of keeled scales (K_2).				
No. of winter-rings	12	13	14	15	Total
	1	9	2	2	14
4	—	2	4	1	7
5	1	6	4	3	14
6	2	11	7	2	22
7	2	13	22	13	50
8	1	9	14	4	28
9	—	4	6	4	14
11	—	—	—	1	1
	7	54	59	30	150

$r = 0.199$; $\sigma_r = 0.079$; $\frac{r}{\sigma_r} = 2.5$.

The correlation between the number of winter-rings and the number of keeled scales seems in this case to be almost certain.

It is now known that the Atlanto-Scandian spring herring is spawning at the Faroes, but at present we do not know anything about the extent of its spawning places there. The extent and exact situation of its spawning places at the coasts of Iceland are not known either, but it spawns at suitable localities in the »warm area«, probably on the whole stretch from Snäfjällsnäs on the west coast to Loonsvig on the south-east coast. P. JESPERSEN has found larvae of this herring of less than 16 mm length in the month of April at 10 stations distributed over this stretch[1]), and, according to communications from Sæmundsson, blood-herrings which have evidently spawned recently are known to occur on various places of this stretch in the months of April and May.

Off the coast of Norway spawning places of this herring occur on the stretch between Kristianiafiord and Kristianssund, and according to IVERSEN[2]) the most important spawning places are found here between Flekkefiord and Aalesund, where the water in the spawning season has a higher temperature than elsewhere at the coast of Norway.

The spawning time for the Atlanto-Scandian spring herring is at the Faroes as at Iceland and Norway the early spring, (probably in the main March-April). As far as we know at present the temperature on the spawning places in the spawning time lies between ca. 3° C and ca. 6° C.

[1]) P. JESPERSEN: On the occurrence of the postlarval stages of the Herring and the »Lodde« at Iceland and the Færoes. Medd. fra Komm. for Havundersøgelser Ser. Fiskeri Bd. VI No. 1. 1920.

[2]) THOR IVERSEN: »Om en subvenert ferskfiskrute«. Aarsberetning vedk. Norges Fiskerier for 1915.

General Survey of the Analyses of spring-spawning Herrings from Kongshavn, the Faroes. Beginning of April 1920. Maturity V—VII. A letter r after the figure denoting number of winter-rings indicates that the last winter-ring is situated quite at the margin, not inside the margin.

No.	Total length cm	Sex	Maturity	Vertebrae			Keeled Scales K_2	Rays in Dorsal Fin	Rays in Anal Fin	Rays in Ventral Fins		No. of winter-rings in scales, approxim.
				Pre-caudal	Caudal	Total				right	left	
1	35.1	♂	V—VI	25	33	58	15	4+16	3+15	9	9	9 r
2	33.2	♂	V—VI	23	34	57	15	4+14	3+16	9	9	8 r
3	32.2	♂	V—VI	24	33	57	14	5+14	3+14	10	9	ca. 7 r
4	32.5	♀	V—VI	23	32	55	14	5+14	4+14	9	9	7 r
5	30.5	♂	V—VI	26	31	57	14	4+15	3+15	9	9	ca. 4 r
6	33.5	♂	V—VI	23	35	58	13	4+15	3+15	9	9	9
7	31.7	♂	V—VI	25	32	57	14	4+16	3+16	9	9	7 r
8	34.8	♀	V—VI	24	34	58	13	4+15	3+15	9	9	ca. 7 r
9	31.7	♂	V—VI	24	33	57	13	4+15	4+16	9	9	5
10	33.7	♀	V—VI	24	33	57	14	4+15	3+15	9	9	ca. 9
11	31.5	♂	V—VI	25	33	58	15	4+15	3+14	8	8	7
12	34.2	♀	V—VI	24	33	57	13	4+15	3+15	9	9	ca. 8 r
13	33.5	♀	V—VI	23	34	57	15	5+16	3+15	9	9	ca. 9
14	31.5	♀	V—VI	25	32	57	15	def.18tot.	3+15	9	9	8 r
15	32.7	♀	V—VI	23	34	57	15	4+15	3+15	9	9	7 r
16	31.7	♀	V—VI	23	35	58	14	4+15	3+16	9	9	5 r
17	29.5	♀	V—VI	23	32	55	14	4+15	3+14	9	9	7 r
18	33.2	♀	V—VI	25	32	57	14	4+15	4+14	9	9	8 r
19	31.1	♀	V—VI	24	33	57	12	4+16	3+15	9	9	5 r
20	30.5	♂	V—VI	24	33	57	13	4+15	3+15	9	9	3
21	32.0	♂	V—VI	25	32	57	14	4+15	3+16	9	9	7 r
22	33.0	♂	V—VI	24	33	57	12	4+15	3+15	9	9	8
23	30.5	♂	V—VI	24	33	57	13	4+15	3+15	9	9	ca. 7 r
24	33.5	♀	V—VI	24	34	58	14	4+15	3+17	8	9	8 r
25	31.7	♀	V—VI	24	33	57	14	4+15	3+15	9	9	7
26	35.2	♀	V—VI	24	34	58	13	4+15	3+15	9	9	ca. 7 r
27	34.5	♀	V—VI	25	33	58	13	4+15	3+15	9	9	7 r
28	33.7	♂	V—VI	25	32	57	13	4+15	3+14	9	9	ca. 7 r
29	32.2	♀	V—VI	25	33	58	14	4+15	3+16	9	9	ca. 7 r
30	33.5	♂	V—VI	24	34	58	13	4+15	4+14	9	9	8
31	32.5	♂	V—VI	24	34	58	13	5+15	3+16	9	9	4 r
32	34.2	♀	V—VI	26	32	58	14	4+15	3+15	9	9	9
33	32.3	♂	V—VI	26	32	58	14	4+16	3+15	9	9	8 r
34	33.5	♂	V—VI	24	34	58	14	4+16	4+16	9	9	6 r
35	32.9	♂	V—VI	25	33	58	13	4+16	3+15	9	9	ca. 5 r
36	31.0	♂	V—VI	25	32	57	14	5+14	3+15	9	9	3 r
37	31.4	♂	V—VI	25	33	58	14	4+15	3+15	9	9	ca. 6 r
38	32.3	♂	V—VI	24	33	57	14	4+15	3+15	9	9	8
39	33.1	♂	V—VI	23	35	58	14	4+15	3+16	9	9	8 r
40	32.7	♀	V—VI	24	33	57	14	4+15	3+15	8	9	8 r
41	32.7	♀	V—VI	24	34	58	15	4+15	3+15	9	9	7 r
42	30.6	♀	V—VI	24	33	57	def.	4+15	3+16	9	9	6 r
43	31.5	♀	V—VI	23	34	57	13	4+14	3+15	9	9	ca. 6 r
44	31.0	♂	V—VI	24	33	57	14	4+15	3+15	9	9	?
45	30.8	♂	V—VI	25	33	58	13	4+16	3+16	8	9	3 r
46	32.1	♀	V—VI	23	33	56	12	4+14	4+14	9	9	ca. 7 r
47	31.3	♂	V—VI	24	33	57	14	4+14	3+15	9	9	5
48	32.5	♂	V—VI	25	32	57	14	4+15	2+15	9	9	6
49	32.8	♀	V—VI	25	33	58	15	4+15	3+15	9	9	7 r
50	29.8	♂	V—VI	23	34	57	15	4+16	3+14	9	9	4 r
51	30.7	♂	V—VI	24	32	56	13	4+14	3+14	9	9	3 r
52	30.5	♀	V	24	33	57	13	4+16	3+17	9	9	3 r
53	32.0	♂	V—VI	24	33	57	12	4+15	3+14	9	9	3 r
54	30.6	♀	V	24	34	58	13	4+15	3+16	9	9	3 r
55	32.8	♂	V—VI	23	34	57	13	4+14	3+15	8	8	9

No.	Total length cm	Sex	Maturity	Vertebrae			Keeled Scales K_2	Rays in Dorsal Fin	Rays in Anal Fin	Rays in Ventral Fins		No. of winter-rings in scales, approxim.
				Pre-caudal	Caudal	Total				right	left	
56	31.4	♂	V—VI	23	34	57	14	4+16	3+16	9	9	5 r
57	30.5	♂	V—VI	24	33	57	14	3+15	3+14	8	9	4 r
58	32.0	♀	V—VI	25	33	58	15	5+15	3+14	9	9	ca. 7
59	31.3	♂	V—VI	25	33	58	14	4+16	3+16	9	9	4
60	29.5	♂	V—VI	24	33	57	13	4+15	3+16	9	9	3
61	31.1	♂	V—VI	23	34	57	13	5+15	3+16	8	9	ca. 6
62	33.3	♀	V—VI	26	32	58	14	4+15	3+15	9	9	ca. 7
63	32.2	♂	V—VI	24	33	57	14	4+15	4+14	9	9	7
64	32.7	♂	V—VI	24	34	58	15	4+15	3+14	9	9	7 r
65	31.6	♂	V—VI	25	31	56	15	4+15	3+16	9	9	5 r
66	32.4	♂	V—VI	24	33	57	13	4+16	3+15	9	9	ca. 7 r
67	31.8	♀	V—VI	24	34	58	14	4+16	3+16	9	9	ca. 7 r
68	31.3	♂	V	25	32	57	14	4+15	3+15	9	9	6 r
69	32.5	♀	V—VI	25	33	58	14	4+15	3+15	8	9	6
70	32	♂	V—VI	25	33	58	15	4+16	3+13	9	9	5 r—6 r
71	35.6	♂	V—VI	26	32	58	14	5+16	4+15	9	9	8 r
72	30.5	♀	V	25	32	57	13	4+15	3+15	9	9	3 r
73	34	♂	V—VI	24	33	57	15	5+14	4+14	8	8	7 r
74	30.1	♀	V	25	32	57	def.	4+46	3+14	8	8	3 r
75	32.7	♂	V—VI	25	33	58	13	5+15	3+15	9	9	8 r
76	35.5	♀	V—VI	25	32	57	15	4+15	3+14	8	9	ca. 11 r
77	31.7	♀	V—VI	25	33	58	15	4+15	4+14	9	9	7 r
78	33.0	♂	V—VI	23	34	57	14	4+16	3+17	9	9	ca. 7 r
79	32.5	♀	V—VI	26	31	57	14	4+15	3+15	9	9	5 r
80	33.6	♂	V—VI	24	34	58	13	4+15	3+15	9	9	7 r
81	31.3	♂	V—VI	24	34	58	13	4+15	3+15	9	9	ca. 5 r
82	30.6	♀	V—VI	25	32	57	13	4+15	3+15	9	9	6 r
83	34.7	♀	V—VI	24	33	57	14	4+14	3+16	9	9	7 r
84	33.2	♂	V—VI	24	33	57	12	4+15	3+16	9	9	8 r—9 r
85	31.8	♀	V—VI	24	33	57	13	5+15	3+15	9	9	?
86	31.5	♀	V	24	33	57	13	4+15	3+15	9	9	3 r
87	35.2	♀	V—VI	24	33	57	14	4+16	3+14	9	9	?
88	35.3	♀	V—VI	24	33	57	15	4+16	3+15	9	9	?
89	31.7	♀	V—VI	24	33	57	13	4+16	3+15	9	9	5
90	35.1	♀	V—VI	24	33	57	14	4+15	3+15	9	9	8 r
91	32.3	♀	V—VI	24	34	58	15	4+15	3+15	9	9	7
92	34.8	♂	V—VI	24	33	57	14	4+15	3+14	9	9	8 r
93	32.7	♀	V—VI	24	32	56	13	4+14	3+14	9	9	7 r
94	32.7	♀	V—VI	24	33	57	15	4+16	3+15	9	9	ca. 7 r
95	33.0	♀	VII[1])	24	34	58	13	4+17	4+16	9	9	6 r
96	32.9	♂	V—VI	25	33	58	15	4+14	3+15	8	9	3 r
97	32.7	♀	V—VI	24	34	58	13	4+15	3+15	9	9	9
98	32.0	♀	V—VI	25	33	58	15	4+16	3+15	9	10	ca. 9
99	34	♀	V—VI	25	33	58	14	4+16	3+15	9	9	7
100	31.2	♀	V—VI	24	33	57	13	4+16	3+15	9	9	8 r
101	33.7	♀	V—VI	24	33	57	14	5+15	3+16	9	9	7 r
102	32.6	♀	V—VI	26	32	58	13	4+15	3+17	9	9	8 r
103	30.6	♂	V—VI	24	33	57	14	4+15	3+14	9	9	4
104	33.3	♀	V—VI	26	32	58	13	4+15	3+17	9	9	7
105	32.0	♀	V—VI	23	35	58	14	4+16	3+15	9	9	7 r
106	31.5	♂	V—VI	24	33	57	13	4+15	3+15	9	9	8 r
107	32.0	♀	VII[1])	24	33	57	13	4+15	3+16	9	9	3
108	35.8	♂	V—VI	25	33	58	15	4+15	3+15	9	9	6 r
109	32.2	♂	V—VI	22	34	56	15	4+15	3+15	9	9	5
110	31.4	♀	V—VI	24	33	57	13	4+15	3+14	9	9	6 r
111	34.2	♀	V—VI	25	32	57	13	5+15	3+16	9	9	9 r
112	33.2		V—VI	25	32	57	14	4+15	3+16	9	9	9 r
113	31.5	♀	V—VI	23	34	57	13	4+15	3+16	9	9	7 r
114	34.1	♂	V—VI	24	33	57	14	4+15	3+15	9	9	8

[1]) Some relic eggs.

No.	Total length cm	Sex	Maturity	Vertebrae			Keeled Scales K_2	Rays in Dorsal Fin	Rays in Anal Fin	Rays in Ventral Fins		No. of winter-rings in scales, approxim.
				Pre-caudal	Caudal	Total				right	left	
115	32.3	♂	V—VI	24	33	57	15	4+15	3+14	9	9	ca. 8 r
116	33.4	♀	V—VI	25	33	58	14	4+15	3+14	9	9	ca. 7 r
117	33.4	♀	V—VI	25	32	57	14	4+16	3+16	9	9	8
118	33.3	♀	V—VI	24	33	57	15	4+15	3+15	9	9	8 r
119	34.6	♀	V—VI	23	35	58	15	4+15	3+15	9	9	9 r
120	31.2	♂	V—VI	23	34	57	13	4+15	3+14	9	9	ca. 6 r
121	32.0	♂	V—VI	24	32	56	14	4+15	3+15	9	9	ca. 7
122	33.4	♀	V—VI	24	34	58	14	4+15	3+16	9	9	6 r
123	33.0	♀	V—VI	23	34	57	14	4+15	3+15	9	9	9 r
124	35.0	♀	V—VI	26	32	58	14	4+15	3+15	9	9	9 r
125	34.5	♂	V—VI	25	33	58	14	4+15	3+15	9	9	7 r
126	32.3	♂	V—VI	23	35	58	13	4+15	3+14	9	9	6
127	30.9	♂	V—VI	24	32	56	13	4+15	3+15	9	9	5 r
128	33.0	♀	V—VI	27	31	58	13	4+16	3+15	9	9	6 r
129	32.3	♀	V—VI	24	34	58	13	5+15	3+14	9	9	8 r
130	33.7	♂	V—VI	25	32	57	14	4+14	3+15	9	9	ca. 8 r
131	34.4	♀	V—VI	26	32	58	15	4+14	3+15	9	9	?
132	32.6	♂	V—VI	24	33	57	14	4+15	3+15	9	9	7
133	34.2	♀	V—VI	25	32	57	13	4+16	3+15	9	9	ca. 7 r
134	31.4	♂	V—VI	25	32	57	12	4+16	3+15	9	9	ca. 6
135	32.3	♀	V—VI	26	32	58	15	4+15	3+15	9	9	6 r
136	32.6	♀	V—VI	23	34	57	15	4+15	3+16	9	9	7 r
137	32.7	♂	V—VI	25	33	58	14	4+14	3+16	9	9	7 r
138	33.8	♀	V—VI	23	35	58	14	4+15	3+14	9	9	ca. 8 r—9 r
139	34.4	♀	V	24	33	57	12	4+15	3+16	10	10	6 r
140	32.1	♂	V—VI	24	33	57	13	5+13	3+15	9	9	6
141	34.8	♀	V—VI	25	33	58	14	4+16	3+15	9	9	9
142	30.5	♂	V—VI	24	33	57	15	4+16	3+14	9	9	3 r
143	32.6	♂	V—IV	24	34	58	15	4+15	3+14	9	9	5 r
144	30.5	♂	V—VI	25	33	58	13	4+16	3+14	9	9	ca. 4 r
145	33.2	♂	V—VI	25	33	58	13	4+15	3+15	9	9	7 r
146	31.5	♂	V—VI	24	33	57	15	4+14	3+14	9	9	ca. 7
147	34.8	♀	V—VI	27	30	57	13	4+16	4+15	8	8	8 r
148	30.1	♀	V—VI	26	30	56	13	5+15	3+15	9	9	5 r
149	32.3	♂	V—VI	24	32	56	13	4+16	3+16	9	9	6 r
150	32.8	♂	V—VI	24	34	58	14	4+15	3+15	9	9	ca. 7
151	33.0	♀	V—VI	25	33	58	14	4+14	3+15	9	9	ca. 8
152	32.3	♂	V—VI	24	33	57	15	4+16	3+15	9	9	7 r
153	33.6	♀	V—VI	24	34	58	12	4+15	3+17	9	9	7 r
154	33.8	♂	V	24	33	57	13	4+16	3+14	9	9	7 r
155	30.5	♂	V—VI	24	33	57	13	4+16	3+15	9	9	6 r
156	32.5	♂	V—VI	25	33	58	14	4+15	3+16	9	9	7 r
157	31.3	♀	V—VI	25	33	58	14	4+14	3+14	9	9	6 r
158	31.0	♀	V—VI	24	33	57	14	4+16	3+15	9	9	3 r
159	34.7	♀	V—VI	28	29	57	13	4+15	3+14	9	9	ca. 8 r
160	34	♀	V—VI	26	32	58	14	4+15	3+15	8	9	8 r

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